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UNFAIR CONDITIONS.

What a shame it is that an institution which should be and could be great, cannot be so. Why is it that the Bell interests cannot see that every telephone man in America is in the same boat, rowing to the same object, and facing the same perils? What an idiotic thing it is that men in the telephone business should ever have the least worry about their commercial lives!

What a foolish thing it is for men to engage in commercial civil war. Yet in our telephone lives, today, it looks as if civil war will be our only remedy for the present intolerable and unfair conditions surrounding the telephone business.—J. C. Kelsey.

An Opportunity for the Trades Commission.

A committee of business men representing the Chamber of Commerce of the United States had a conference the other day with the members of the Federal Trades Commission. There was an exchange of ideas which resulted in the committee leaving with the comforting belief that, while the new commission has no intention of "ripping up" things, it realizes its duty to see that justice is done to all lines of trade, both large and small. As one of the men present expressed it, "the commission told the committee that it (the commission) was about to enter upon a constructive program, and that, in disposing of complaints brought by small business men against large, it would attempt to get the two interests to co-operate."

Should either of the two parties prove stubborn and fail to manifest a proper spirit of co-operation, it will then be up to the commission to discipline the offender. Then will come the test as to whether the law is adequate or not, and whether or not the commission itself is disposed to carry out the intention of the popular movement that placed the law on the statute books. The trend of sentiment affecting business relations seems to be that it is no crime for a corporation to be "big", so long as it does not utilize its greater size and power to oppress its humbler associates. All the small business man wants is a square deal and a chance to develop and grow according to his ability, without being unfairly hampered by those enjoying larger opportunities.

The case in point in the telephone field, of course, is the alliance between the American Telephone & Telegraph Co., and the Western Electric Co. It should not take the Federal Trades Commission long to determine that the Bell has no right to be engaged in both the operating and manufacturing lines and at the same time sell merchandise to Independent companies. This constitutes a condition that works an unbearable hardship on Independent manufacturers, who are barred from selling apparatus to Bell licensees.

If the trades commission attempts "to get the two interests to co-operate," it will not take the Independents long to recommend a remedy. In fairness, the Bell should either separate from the Western Electric and buy in the open market, or manufacture only for itself and keep out of the Independent buying field. Here is a good place for the new Trades commission to begin its work.

The Voice Without the Smile.

The new exchange had been cut into service. "Open house" was held for three afternoons and evenings. Hundreds of people inspected the new fireproof building and its equipment which serves some 8,000 subscribers. Visitors were met at the door by smiling, courteous employes and conducted in parties from one part of the building to another. The operating room naturally received the greatest attention from visitors. Methods of answering, connecting and calling were carefully explained by courteous young women. At the close of the in-

spection, the visitors were invited into the operators' rest room and there served with refreshments from the clean, attractive lunch counter.

Altogether, everyone was favorably impressed with the exchange and the people engaged in furnishing them telephone service. They left the exchange expressing their goodwill to the smiling attendant at the door. Some of the mysteries of telephone operating had been explained to them. Many had suspicions that possibly not all the blame for the wrong connections sometimes obtained, was chargeable to the operator. They felt most favorably toward the company for "the voice with the smile" had been very much in evidence.

The next day, one of those who had been so favorably impressed, called a number—"Three, eight hundred." The operator's repetition sounded like "three hundred." Again he gave the number, "three, eight hundred," and again received the repeat "three hundred" as the operator cut out to ring. He signaled the operator and said, "I asked for three, eight hundred." "Three, eight hundred, that's what I said," was the reply in a voice which was far from being "the voice with a smile." Then the subscriber wondered if any others who had been so favorably impressed during the inspection of the new exchange, had encountered that particular operator with "the voice without the smile." It seemed to him that it was very easy for one person to destroy goodwill which had taken the combined efforts of so many persons to create.

The Wire-Making Machine

By HERBERT KAUFMAN

Your business is going to pot—starving for new blood. Competent men won't work for you. They avoid your office and don't give you a chance to employ their talents or engage their services. Instead, they're building up your competitors—supplying the mental ordnance with which to batter you out of the game.

All the first class youngsters have your rating and they won't trust you. You're a wire-making machine, incapable of measuring affairs of magnitude. It's a waste of valuable time and plans to submit to you an important proposition. There isn't sufficient space left in your ossifying brain to accommodate it.

Once upon a time you must have been broader gauged. It's incomprehensible that you should have reached a position of eminence and have won the right of decision, except through the exhibition of enterprise and the exercise of shrewdness, but success has been your ruination.

You're not hard-headed, but bone-headed. A revolutionary suggestion can't squeeze through the tiny peephole behind which you view values—only as much of it as you are capable of comprehending will gain admittance. And so folks who can possibly procure an unprejudiced hearing elsewhere, won't allow you to reduce their splendid projects to tidbits.

You're a self-complacent ignoramus, and despite your original power you can't survive. You aren't growing, and so you'll soon be going. You have assumed the role of teacher. Since you consider it beneath your dignity to become a pupil as well, whatever knowledge you have accumulated, is long since obsolete.

Every good merchant knows that buying is nine-tenths of selling; and so thoroughly is this principle recognized that efficient business men do not wait until novelties are brought to them, but keep their ablest buyers scouting in the markets to meet originality half way on the road.

You can't hold your place by warding off bigger men than yourself; the profit and loss statement will give your number—results count and never make a mistake in the figures.

You've adopted an attitude of such pernicious egotism that rather than acknowledge anybody equal to an emergency with which you cannot cope, you prefer to play dog in the manger to the point of sacrificing your welfare. You'd rather sink in a quagmire of vanity than be rescued from failure by an outsider.

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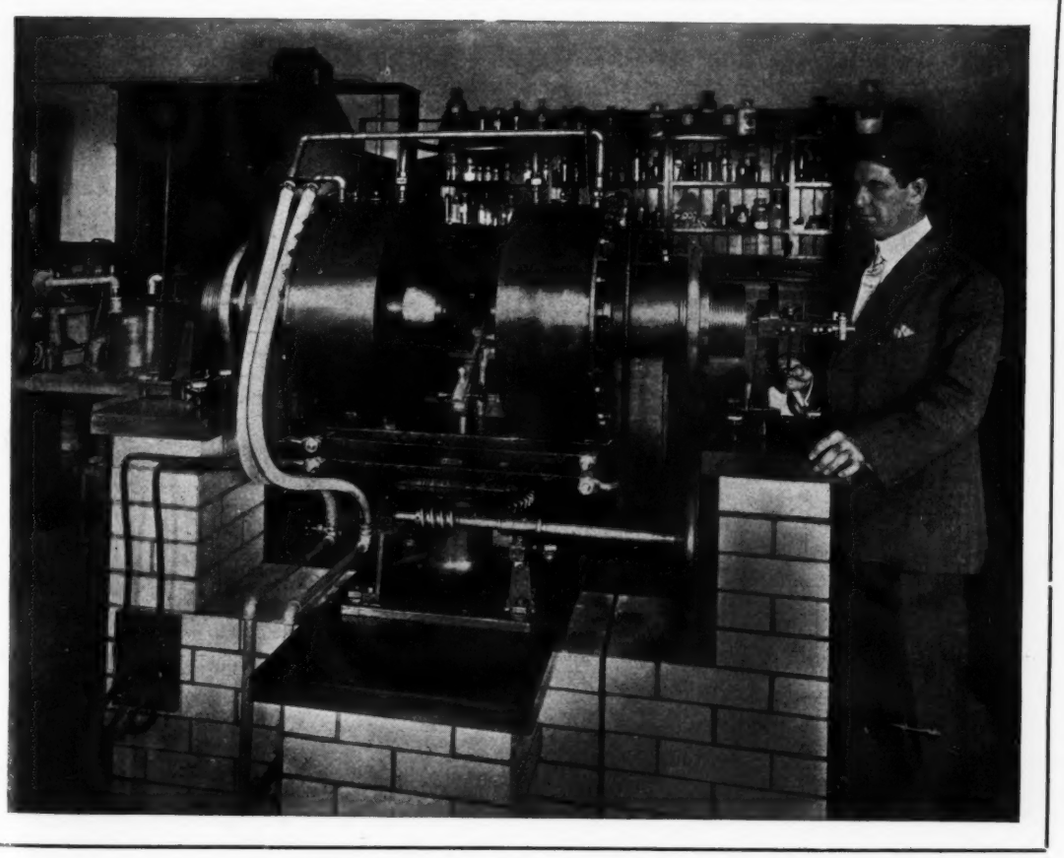
A Wonderland of Science — U. S. Bureau of Standards

Equipment Used in Establishing Standards of Measurement — Instruments of Inconceivable Delicacy and Precision and Testing Machines of Wonderful Power and Accuracy—From National Geographic Magazine, Washington, D. C., Copyrighted, 1915—By Special Permission

[EDITOR'S NOTE: In connection with its duties of maintaining standards of weights and measures the United States Bureau of Standards has recently inaugurated a work involving the determination of standards of service and practice for public utilities. The Bureau of Standards has not authority to compel the use of any standards it may determine. It can specify or detail but such specifications and details must be duly approved or legislated by competent authority. The Bureau studies a problem in the light of the best scientific and technological knowledge and recommends a solution which may or may not be utilized. Telephone men are interested in standards as is evidenced by the appointment of a standardization committee by the Independent Telephone Association of America. The facilities of the Bureau of Standards, which are described in the following article, are, of course, available for aiding in determining standards for telephone service and equipment.]



The Most Powerful Magnet in the World.

Standing on one of the many high hills that fringe the Nation's Capital, is a group of buildings that house one of the greatest aggregations of wonder workers in the new world. In their enchanted chambers, truth makes fiction seem tame and commonplace; men make fairies appear weak, insipid and impotent as doers of strange things.

Entering there, one may see a grain of sand become a mountain, an inch become a mile, an unappreciable zephyr become a howling storm, the football of a fly the thundering tread of a draft horse upon a threshing floor, the heat of a candle a roaring furnace, the unperceived warmth of a star a cheering fireside, and the pressure of a finger the force of a thousand giants in one.

These enchanted chambers are the creation of the United States Bureau of Standards, which not only stands between the American people and the short weight and false measure, but also is laboring, day in and day out, to promote all branches of science. Some philosopher has recently declared that the science of tomorrow will have to be largely based upon investigations that carry the investigator beyond the sixth decimal place. In other words the truths upon which our scientists will base tomorrow's progress in the adaptation of scientific facts to human need, lie beyond a millionth of an inch, beyond the millionth part of an ounce, beyond the millionth part of a degree of temperature.

Just as James Watt could not make a steam engine until men were able to take measurements so exact that a cylinder and piston could be built which were steam-tight and yet allowed free play, so the perfect automobile of today had to wait until men could measure the five-thousandth part of an inch, and the perfect ship's chronometer until he could measure distance five times more minute than that. As the carpenter seldom finds it necessary to consider anything less than the thirty-second of an inch, and the automobile builder five-thousandths of an inch, each trade and profession up the scale demands greater refinement, until it reaches limits inconceivable to the layman, and yet in the end as important to him as any lower limits. In short, then, the work of the Bureau of Standards, aside from the protection of the whole people from false measures, may be said to be that of refining the yardsticks of science.

There can be seen instruments of such delicacy and precision that the mind at first fails to grasp the full significance of what they can accomplish. In one room is a balance so sensitive that the mere presence of the operator's body generates an amount of heat sufficient to disturb its accuracy. In another there is one so delicately adjusted that it shows the loss of

weight due to the reduction of the earth's attraction when two pieces of metal are weighed one upon another instead of side by side.

Remarkable beyond the imagination are the heat-measuring instruments which register infinitesimal fluctuations of temperature. A ray of light may have started ten years ago from some distant star, and may have spent all of those ten years hurtling earthward-bound through space at a gait so astounding that it could girdle the globe in far less time than it takes to blink the eye; and yet when it falls upon the senstitive bolometers at the Bureau of Standards they will tell the observer how much heat the ray brought with it from the star to the earth.

Such are a few of the most delicate instruments. But there are others which are as powerful as they are sensitive. In the engineering laboratory there is a huge testing machine which can tear apart the strongest steel girders used in building great sky-scrapers, while on the floor above are little electrical furnaces capable of generating a heat so intense as to melt the most refractory materials. The Bureau can measure accurately cold great enough to liquefy the very air we breathe, and heat which can melt solid rocks.

Sugar Costing $15 Per Pound.

This is a commercial age, and even this institution, so eminently scientific, has something to sell. For example, it will supply pure, absolutely pure, sugar for the trifling sum of $15 per pound—under cost price, in fact—and yet, surprising as it may seem, there is a ready sale. But the average man may very well say: "I can buy all the sugar I want at six cents a pound, and I have no earthly interest in the quality of a star's heat. How does this Bureau affect me?"

Directly it affects him not at all; indirectly it touches him at almost every hour of the day. Though he may not know it, he probably pays for his gas by the heat value fixed by that high-priced sugar, his electric light bulbs by the candle power determined by the Bureau, his meats by the weights, and his wines by the measures the Bureau has standardized. The imported sugar at his breakfast table, the rails over which he traveled to the city, the concrete flooring in his fireproof office building, the steel girder supporting the roof above his head, all owe a debt to the researches conducted by the Bureau.

Formerly weights and measures were restricted to length, area, volume and weight. But now the scope of weights and measures is immensely broadened, for many new commodities are in the market which were formerly unknown, such as electric current, light, heat, refrigeration, and services of other kinds. The term "measures" now includes the measurement of energy, velocity, power, illumination, and electricity.

The standardization of these new, and often intricate, measures requires very elaborate equipment and a high standard of scientific attainment in the worker.

The Sort of People Who Need the Bureau.

Perhaps the best idea of the far-reaching work of the Bureau may be gained by glancing over the mail arriving any morning at the director's office. There are letters from iron founders, tanners, iron pipe makers, textile engineers, optical instrument makers, dyers, photographers, universities, well sinkers, Chicago meat packers, glass makers, municipalities, manufacturers of refrigerating plants, contractors in concrete, railroad officials, lamp makers, boiler makers, chemical manufacturers, railroad commissioners, glass blowers, paper makers, officials of international scientific commissions, makers of fine mesh cloth for sieves, engineering firms, dry goods houses, officials of almost every department of the Federal government, makers of oleomargarine, carpets, water meters, gas meters, and watches, and finally, officials of foreign governments. Thus the Bureau does for the manufacturer something of what the Department of Agriculture is doing for the farmer.

Perhaps the division of weights and measures has a greater interest for the layman than any other division of the Bureau. In this division are preserved the fundamental standards upon which all measures of weight and length depend. These are kept under double glass cases in a fireproof safety vault and are never used except to check the copies that have been adopted as working standards.

The unit of length is the *meter,* which is defined as the distance, at the temperature of melting ice, between two fine lines ruled on a bar of platinum-iridium, which is kept at the International Bureau of Weights and Measures at Breteuil, near Paris, France. Accurate copies of this bar have been made and distributed to the various governments of the world. That preserved at the Bureau is No. 27.

In shape it resembles the letter "T," with the uprights bent slightly outward. The scale marked upon it is so fine as to be almost invisible to the naked eye. When this prototype is to be compared with any other meter, both bars are placed side by side in a receptacle. The receptacle is then placed in an oil bath in a trough-like comparator, which is kept at an even temperature. Microscopes are mounted on an invar-steel bar, and with the most delicate micrometer screws are adjusted to the prototype. The standard to be compared is then brought beneath them and the difference, if any, is recorded. Observations are made to the 1/254,000th of an inch.

Measures of considerable length—as, for example, the invar tapes used in the United States Coast and Geodetic and the Geological Survey, which are tested by the Bureau before and after each expedition—are compared in a long tunnel in the basement of the main building. In this tunnel, which is kept at an even temperature by means of a series of hot and cold pipes, a five-meter bar, packed in ice and mounted on a movable carriage, together with microscopes mounted on independent piers at fixed intervals, is used to test any bar or tape up to 50 meters in length. On the other side of the tunnel is an iron bar 164 feet long, in which platinum-iridium plugs are inserted at intervals. This also is used for testing tapes and similar measures requiring less exact determination.

The standard of mass, which most people call weight, is the *kilogram.* This standard is also of platinum-iridium and, like the meter, comes from France. The Bureau possesses two copies of the original kilogram numbered 4 and 20. From this prototype all other weights, such as the pounds avoirdupois and Troy, are derived.

The weights tested by the Bureau range from those used by city and state scalers in testing the weights and measures of commerce, down to those used by scientists in most precise and exacting work. To do such testing as this, the very finest instruments are required, and weights which vary from great masses, as big as a steamer trunk, down to tiny atoms, which would look lonely on a pin's head. The smallest of these is the 1/20th milligram, or 1/600,000th of an ounce. Though made of the lightest metal known, aluminum, when set on a balance one has to look carefully in order to be sure that it is not a mere scratch on the surface of the weighing pan. The balance on which this weight is used can weigh with accuracy down to 1/50,000,000th of an ounce.

On one of the balances the weighing is made in a vacuum, so that the weight and bouyancy of the air does not interfere with the result. Another balance is so sensitive that it can detect the difference due to the diminution of the earth's attraction. To prove this, an experiment was especially performed for the purposes of this article. Two kilograms were weighed side by side. Then one kilogram was placed on top of the other, and was thus elevated 5 centimeters, about two inches. It was found that the weight was 0.016 milligrams less than when they were side by side. The precision of this instrument can be appreciated by this experiment, for it shows that it can weigh down to 1/100,000,000th of the whole.

Some of these balances are so delicate that the heat of the operator's body near them would cause a disturbance. Their adjustment is effected by rods and other ingenious mechanisms.

which change the weights from pan to pan or add the finer V-shaped weights to the cross-beam to effect a perfect balance. The operator stands at a distance of 10 feet and reads the result through a telescope.

One of the balances used in the voltmeter work is so delicately adjusted and sensitive to changes of temperature that the operator cannot even remain in the same room with it. It is kept in a room guarded by double doors, in which a constant temperature is preserved. The rods by which it is controlled reach through double glass panels into a second room, which is also at an even temperature and guarded, too, by double doors. In fact, to approach this balance is a ceremony. One decends into the crypt; four doors have to be unlocked in turn; lights have to be lit; and finally, if one is especially favored, the glass case which envelopes it may be opened for a brief inspection. One feels that the poor thing suffers physically when subjected to morbid curiorsity.

Every precaution is taken that the weights are not touched. They are kept in glass cases and dusted with camel's hair brushes. Forceps are used to handle the smaller weights, and lifters covered with chamois leather for the larger ones, as the deposits from even the cleanest hands would render them inaccurate.

One division is conducting a series of very important investigations upon the behavior of aneroid barometers, which are of the greatest interest to the geographer, to the explorer, the surveyor, the mountaineer, and the aviator, for the aneroid is an instrument of the highest importance in their work.

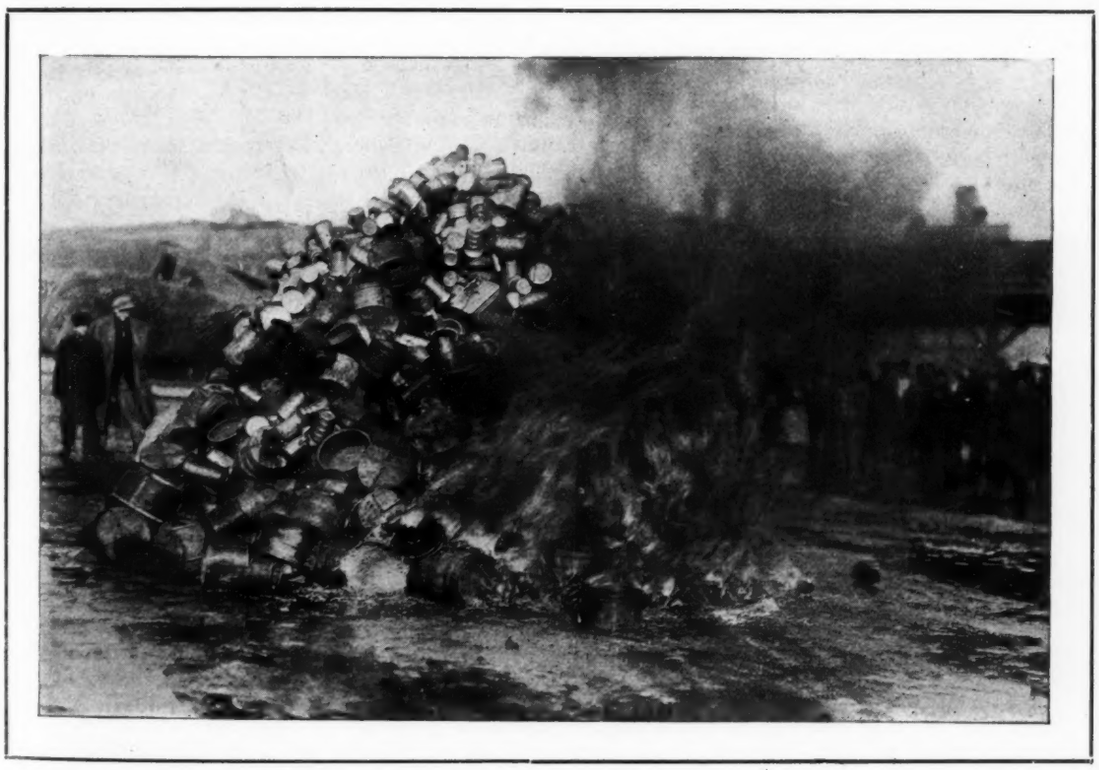
Why Aviators' Figures Are Unreliable.

Experiments show that the effect of temperature is usually negligible compared with the mechanical and elastic errors to which even instruments by the very best makers are liable. It has been found that an aneroid carried slowly up the side of a mountain will give an entirely different reading from that given when taken rapidly up the same mountain in an electric railway.

As an instrument for measuring height it has been found very unreliable unless thoroughly studied. Therefore when an aviator announces from the readings of his instrument that he has made an ascent of 15,748 feet, his figures may be promptly discounted, the real truth being that the ascent was probably about 15,000 feet or even less, or that it might have been over 16,000 feet, depending upon the method of making the instrument.

To show how unreliable such figures are, when uncorrected, seven aneroids of the best known make, each of them as fine an instrument as could be procured on the market, were taken up together in the same aeroplane. The ascent was made, the height recorded, and the machine descended. Upon examining the readings of the seven aneroids it was impossible to find out how high the aeroplane had ascended without a careful study of each instrument for one instrument recorded a height of over 2,000 feet—the highest reading—while the lowest reading was 670 feet less, or something under 1,400 feet.

In the division charged with the standards of heat, researches are being conducted which it is hoped will lead to international agreement as to the standard scale of temperature. Strange as it may appear, only two points are at present standardized, namely, the freezing and boiling points of water. Above and below these nothing is fixed. In this division the clinical thermometers used by the medical profession are tested and their accuracy to the tenth of a degree certified, upward of 20,000 being handled in the course of a year. The delicate Beckman thermometers, which are used by chemists and engineers in the trials on which the award of large fuel contracts are based, the high-temperature thermometers, reading up to 1,000° Fahrenheit, and the low-temperature pentane thermometers used for temperatures as low as 300° below zero Fahrenheit, also receive their share of attention in this department.



A Bonfire of Short Measures in One of Our Large Cities.

In another room is to be found apparatus by which such intense cold can be produced that even the air we breathe becomes liquefied and can be handled as so much water. Put a bar of steel into it and it will burn as if it were tinder, in spite of the fact that the steel and the air have been intensely cold.

Close by in another room is the opposite extreme, the point where we begin to realize the meaning of the expression "fervent heat." There the hardest metals that exist melt as a pile of snow under an April sun, and yet this division has to devise heat-measuring instruments as sturdy as the bolometer is delicate, so that they can endure it and register its temperature.

In high-temperature work the Bureau measures accu-

rately heat up to the temperature of the sun, by means of complicated and delicate instruments known as pyrometers. These instruments are used in many industries, for example, in the hardening, annealing and tempering of steel, the melting and pouring of molten metals in foundries, the burning of ceramics, the melting and annealing of glass, etc., and many are tested and standardized by the Bureau.

High temperatures emitted by bodies when they are incandescent or at red or white heat, are measured by optical or electrical means. Thus, for example, the bolometer measures by optical methods very small amounts of radiant heat, and can record accurately changes of temperature of less than a millionth of a degree Fahrenheit.

Bending a Steel Bar with One Finger.

In the division of optics many tests are made, for the government and the general public, of telescopic and photographic lenses, prisms, samples of glass, and optical instruments and accessories. Work has been planned which will lead to the standardization of the colors of textiles, papers, tobaccos, butter, dyes, liquors and many other commodities.

The fundamental basis of the work of this section is the light wave. If all the standards of length in the whole world were by some accident destroyed the meter could be exactly reproduced from the red line in the spectrum of cadmium, as it is invariably, exactly 1,553,163.5 of these wave lengths forming the length of a meter.

Light waves form the unit of measurement in one of the most precise instruments known to science. This is the interferometer, which can accurately determine differences in length as small as two-millionths of an inch, or measurements so minute as to be beyond the range of the microscope.

To show the delicacy of this method, the Bureau has evolved a remarkable scientific device, with which the visitor can see the bending of a steel bar 3 feet long and 3½ inches in diameter beneath the pressure of one finger. This bar is supported at each end and a small mirror is fixed at the center. Above it is a frame bearing another partially silvered mirror, both of which reflect the light of a sodium burner, the lower mirror showing a series of black and yellow concentric rings. The slightest pressure on the bar—even the weight of a visiting card or a pin—causes these circles to expand outward, forming, as it were, a series of ripples like those made when a stone is dropped into the center of a still pond. The pressure of one finger on the bar causes the formation of five or six new circles, showing that the bar has been bent about 1/20,000th of an inch, as each new circle means a movement of 1/100,000th of an inch.

At first sight the testing of sugar would seem, to the lay mind, at least, to belong to the department of chemistry rather than optics. But it has been found that the most perfect test of sugar is an optical one. The amount of impurity is found by watching the twist of a light wave passing through a sugar solution of a certain strength. This is effected in an instrument known as a saccharimeter, and on these tests the import duty is based. Samples of sugar are sent daily by the Customs service at the various ports of entry for check analysis, and in this way uniformity of analysis at the custom houses all over the country is secured.

In the division of chemistry nearly 9,000 tests are made in a year, and almost all of them for the government. Commissions are only accepted from private bodies when such work cannot be done anywhere else, for the Bureau declines to enter into competition with private laboratories. Under exceptional circumstances, however, umpire testing or analysis is undertaken.

In the engineering division the most impressive feature to the layman is the huge Emery testing machines. The larger one has a 2,300,000 pounds compressive power and a pulling power of 1,150,000, while the smaller one has a tension and compression strength of 230,000 pounds.

These great machines are of wonderful delicacy and power. After exerting and accurately registering a pressure sufficient to break a huge steel girder, an egg shell can be crushed and the force exerted recorded with equal accuracy.

In the branch of the Bureau at Pittsburgh a still more powerful machine has been installed—the great 10,000,000 pound Olsen testing machine. These machines are used in a series of investigations conducted jointly by the Bureau and the American Society of Civil Engineers, to check and correct the formulas for computing column strength, the formulas upon which the efficiency and safety of building construction depend.

Another very interesting series of researches is in progress, which may have the effect of saving many valuable human lives. Railroad companies send to the Bureau rails that have failed, and efforts are being made to discover a new method of testing them. At present when a rail (or any other piece of iron or steel) is tested, it is destroyed in the process and becomes useless. Often a rail is full of flaws, but at present there are no means of discovering this until the rail fails beneath the pressure of the express that thunders over it.

For the last six years the experts of the Bureau have been seeking for a method of testing the rails that will actually be used, and have conducted a series of mechanical and magnetic tests to discover some mechanical properties which can be proved always to accompany certain magnetic properties. The results of the work are so hopeful that those enaged upon these researches are justified in believing that further studies along these lines will eventually lead to success.

What Is the Strength of Red Tape?

In another division are tested a bewildering variety of commodities used by the government—ink, paper, rubber, clay, brick, oils, ropes, leather, cloth, silk, sealing wax, mucilage, paint, and a hundred and one other things. Everything handled by the Federal government is tested in this section, from the steel for the locks on the Panama Canal down to the brushes used to sweep out department offices. Even that well-known article, red tape, receives due attention. Its material is examined; its color tested; its breaking strength established; its every property is determined, with the solitary exception of its obstructive force, as that is beyond the power even of the Bureau of Standards.

Nearly 30,000 samples of the cement bought by the government were tested last year, representing a purchase of more than 2,000,000 barrels. It has been found, on submitting concrete to steam-curing that in many cases the compressive strength per square inch may be increased as much as 500 per cent. or more, while in other cases the concrete simply crumbled away. This striking difference is assumed to be due to the presence of harmful material in the concrete that failed. Further experiments are being made, as it is hoped that this simple test will finally eliminate the tedious and costly tests now in use, and that the composition of concrete may be in some measure standardized.

How Much Silk Does a Silk Dress Contain?

In the textile division investigations are conducted into the physical properties of materials, from the raw fiber to the finished article, and it is interesting to note that many curious adulterations have been discovered. For instance, tin and tungsten salts are used to give brilliancy and "body" to silk, in some black silks as much as 40 per cent. being used.

(*Concluded on Page* 40.)

Fundamental Principles of the Telephone Business

A Reading Course Designed to Present Logically the Principles Which Underlie Successful Organization and Operation of Telephone Properties —Prepared Under the General Supervision of Stanley R. Edwards—This Section on Economics of Telephony written by James H. Shoemaker

Quiz Questions on the Preceding Installment.

56. What reasons are advanced to show a relation between ownership and orderliness?

57. Outline two general ideas now prevailing as regards orderliness.

58. Name some things which must be borne in mind in the consideration of the relationship of ownership and operation to orderliness and the law.

59. Upon what is the exercise of authority tending to depend? What is the greatest immediate economic need connected with the subject of ownership and operation of utility plants?

60. What relation between ownership and regulation is expressed?

CHAPTER IV. Regulation, Legislation and Management.

61. *Regulation Defined.*—"Ten years ago no state, except Massachusetts, had a commission empowered to deal with municipal utilities," said Edward W. Bemis, member of the advisory board, valuation department, Interstate Commerce Commission, in an address at a "Conference of American Mayors on Public Policies as to Municipal Utilities," at Philadelphia, in November, 1914. At the same conference, Halford Erickson, of the Wisconsin Railroad Commission, said: "The *policy* of regulating private economic enterprises through the agency of government is as old as the common law."

Now it should not be assumed that Mr. Erickson and Mr. Bemis disagree with each other as to the age or the origin of the theory or the practice of regulation. On the contrary, it seems safe to assume that neither they nor the delegates who listened to them, noticed the slightest hint of contradiction or disagreement. Mr. Bemis was speaking of the practice of regulation as actually applied by state legislation to municipal utilities in the United States. Mr. Erickson was referring to the origin of the theory of regulation, and to the practice of other countries in former periods of the world's history. Continuing Mr. Erickson said:

> During the Middle Ages, the policy of regulating economic activity was general and comprehensive. During modern times the policy has largely been reversed. Competition is now depended upon to regulate prices and conditions in practically all undertakings except those which, like the utilities, are monopolistic in their nature and which furnish necessary service.

In order to give the reader the full benefit of Mr. Erickson's thought, the following portion of his address is quoted:

> The policy of regulating private economic enterprises through the agency of government is as old as the common law. *The common law represents the prevailing public opinion which in turn is influenced by the ideals of the period.*
>
> Public opinion has always demanded that government protect equally against those forces which threaten life and those which threaten the means of living. In the case of utilities, public welfare demands that the government shall step in and furnish such protection as may be needed.

Here we have a part, at least, of both the theoretical and the practical meaning of the word "regulation." We have a hint, also, of this fact: During recent years, in the minds of the people in general and among thinkers in the United States more especially, this word (regulation) has been taking unto itself a new meaning. It is winning for itself a better appreciation; and it is being given a place of larger and constantly advancing importance.

The *policy* of regulation is as old as the common law. But, so far as the United States is concerned, and so far as the popular appreciation of the people of this generation is concerned, the prevailing *practice*—of enacting legislation for the regulation of privately conducted enterprises—dates back less than fifteen years. John M. Eshleman, former president of the Railroad Commission of California, and now lieutenant-governor, at the mayors' conference previously alluded to, presented a paper on the subject, "What Regulation Must Accomplish if It is to be Permanent." Extracts from his address are presented as showing the development of regulation.

> Regulation is not a new thing. It is well, however, to have in mind the fact that regulation, as we here understand the term, is only one aspect of a broader conception. Regulation in this broader conception is as old as civilization itself and its justification is found in the maximum which I roughly translate, "So use thine own as not to injure others." All private property is held subject to this well known and justly accepted rule.
>
> If a man lived alone upon some Robinson Crusoe island, there would be no need for regulation of any sort. But as soon as we have two (on the same island or continent) then we have relationship—a relationship which must be controlled by some convention (a relationship which must be regulated by legislation). Thus all law arises from this necessity of regulating relationships.
>
> Neither personal liberty nor the right to private property requires, nor will permit to the individual, absolutely unrestrained (or unregulated) action . . . We must use our individual liberty and our private property so as not to do injury to others . . . and this rule is a part of our title to our property—a part of our right to our liberty.
>
> While it is easy to state and agree with this general rule, yet the economic problems of all times have arisen from the differences (of opinion) on the question as to what limitation should be put upon individual liberty and upon the use of private property—to accomplish the desired result.
>
> Regulation in its broader significance is the restraint which society (or the state), as an institution, places upon individuals. Regulation, as we generally accept the term, however, represents a more intimate hold by the state upon a property, or business, or a person, than the one we have generally referred to.

In setting forth the purposes for which the practice of utility regulation is being established by our federal congress and our several state legislative bodies, Mr. Erickson begins as fol-

lows: "The purpose of such regulation is to see to it that the public is adequately served at reasonable rates, *without unjust discrimination.*"

62. *One Cause of Regulative Legislation.*—While he was chairman of the Interstate Commerce Commission, Franklin K. Lane said it is not surprising that the managers of utilities —and of railroads more especially—adapted themselves slowly and somewhat ungraciously to the new order of things called regulation. It has been, he stated, a tedious and difficult thing for them first to comprehend and next to submit to the fact that their businesses have been singled out from the other private enterprises with which they were by common consent formerly classed.

It has been a tedious and difficult task for them to realize and to adjust themselves to the fact that they have been *drafted* out of private life and *sworn in* as servants of the public. In almost every state in the nation, the telephone business has been "drafted." By the power of law, and against its own inclination, it has been taken from among private undertakings. It has been "sworn in" as a public (utility) servant. It is no longer allowed to join with other business in the practice of charging all the traffic will bear. It is now compelled by law to be forever as serviceable to the public as possible. It is no longer a private affair, whether privately owned or publicly owned. Therefore it must be conducted upon the same fair and dignified plane as is the business of the just judge, the faithful policeman and the efficient postman.

It was hard for those who led the railroads in former years to see the avalanche of ill-will they were cultivating among nine-tenths of the voters by their system of rebates, secret and open special rates, free passes and other forms of favoritism. It was a tedious and difficult task for those who led in railroad affairs to see that they were building up the usefulness of their service to the point where the people, as a whole, were becoming wholly dependent upon them; to realize the tremendously important relationship which they were gradually completing between their roads and the means of living of all the people.

One great cause of the first regulative legislation was this failure of the leaders of the transportation business to foresee, and their consequent neglect to forestall, the avalanche of protest which grew up in the spirits of those individuals and communities which had a real or fancied grievance because of special transportation favors extended to others.

The author realizes that it is not sensible, nor is it fair, to censure others for failing to accomplish this tedious and difficult task more quickly. But in perfect kindliness, and in all good sense, everyone can regret the misfortune of failing to see earlier that the transportation service had become too necessary, or too sacred, to permit of the practice of unjust discrimination. But it was this misfortune which caused the first of this newer form of regulative legislation that, in the words of Mr. Eshleman, "represents a more intimate hold by the state upon a property, a business, or a person."

63. *Elements Leading to Demand for Regulative Legislation.*—The so-called granger agitation began to make itself felt in the seventies. It became strong enough to cause an exhaustive Congressional investigation of the favoritism practiced by the railroads. Later this granger agitation concerning railroad discriminations caused the enactment of the Interstate Commerce law. The telephone was not invented until 1876. It had no part, therefore, in the agitation which caused the Interstate Commerce Commission. This becomes all the more clear as we reflect that whereas the Interstate Commerce Commission was given authority over the railroads in 1887, *a quarter of a century elapsed* before it was given power in regard to telephones.

When the history of state regulation of utilities is studied, this point stands out in all its clearness: Certain state railroad commissions were established about the same time as the Interstate Commerce Commission, but it is only within the last ten years, or so, that any state has attempted legislative regulation of telephones. The explanation for this is not hard to find. By means of a relatively small favor (or rate reduction), a railroad might place certain shippers at an advantage over their creditors which would amount to thousands of dollars monthly. But there is no opportunity for anything like an equal amount of injustice between patrons through favoritism in telephone rates.

While it must be admitted that the moral, ethical and economic evil of favoritism is just as bad in *quality* in the case of the telephone, it must also be observed that it cannot possibly be as great in quantity. It should be observed, further, that in the beginning, legislative regulation was demanded, not for the benefit of the railroads, but for the benefit of the railroad patrons.

There is another, a later element, behind the demand for legislative regulation of utilities—an element which the telephone did help to create. We have just been passing through the period of greatest economic development that is known to the mind of man. It could not have been otherwise than that this should have been the period of the greatest economic risks. Neither could it have been otherwise than that undreamed of economic advantage, in the form of "wealth," should pass into the proprietorship of those who were most successful in the taking of these enormous hazards. But from the viewpoint of one studying the legislative regulation of utilities, the most important phase of the matter is this: The prevailing inclination to "get something for nothing," or to "get rich quickly by taking a risk on a 'sure thing'" has been appealed to with tremendous effect; and in few, if any, other industries has the unworthy exploiter of "shares" been more viciously active than in the realm of the telephone.

In the age of wild cat speculation few fields were used to better effect by the "unloader" of unreliable (and unsecured) "securities" than that of alleged inventions and undertakings pertaining to wire-using and wireless types of telephony. Therefore the self-interest of those who earned commissions from the sale of shares and bonds led them to exaggerate the profits obtainable from the business.

A man wearing a silk hat, appeared at state and national telephone conventions, about the years 1903 to 1908, exploiting a most mysterious alleged invention—a magnetic current which was both alternating and direct for the reason that its alternations were of "infinite frequency." The author happened to be managing a telephone system in those days in the territory around West Union, Iowa. This man, of extraordinary powers of persuasion, had many telephone men "guessing" as to the practicability of his proposal. He purposed to "lay armored

cable in furrows made by the ordinary plow—radiating hundreds of miles in every direction from West Union—and to give every farm-owner light, heat and power over an individual circuit from his dynamo—with a 10-cent, three-minute talk to any place in the United States." Of course it seems ridiculous now, but in those days he got checks for "shares" from men of importance in other lines of business.

This and other similar efforts to exploit the buyers of "shares" placed letters in the hands of ministers, teachers, and newspaper men containing tons upon tons of cunningly devised "proofs" that the telephone business was astoundingly profitable. Farmer companies of the mutual type, falsely so-called, professing to operate at cost but in reality operating upon donated "help," joined in with this chorus and testified that they had actually "operated for five years at a cost of 25 cents a month." One mutual (?) company gave wide publicity to the alleged fact that "by charging a dollar a month for telephones rented to non-members," it had been able to run for four whole years without one cent of expense to its shareholders.

In the opinion of the author, it is important that the reader should recall matters of the sort here set forth. It is essential that a correct view be gained as to the importance of these things. They were an important element in the cause of legislative regulation of telephones. They affected, indirectly, the legislative regulation of utilities in general. It is not possible to deal as effectually as we should concerning regulation for the future unless we reckon from whence we have traveled, as well as the end which we should attain.

The railroad managers failed to foresee that they were making themselves unusually useful to the public. They did not see that the railroads were gradually becoming different from ordinary or so-called private undertakings. They failed to appreciate how utterly dependent upon the railroads the people were becoming. They failed to see how useful, how necessary and how sacred they were making their undertaking. They neglected to remove favoritism or discrimination; and the oversight behind that neglect was the earliest of all the elements which have caused the legislative regulation of utilities. But the element, which is second in point of time, is this speculative exploitation of the people in which the telephone was used by farmers companies and promoters as an example of enormous profits.

(*To be Continued*)

Managers of Central Home Company Hold Annual Meeting

"Efficiency" Main Topic up for Discussion—Prizes Awarded for Efficiency Work During 1914—Managers' Organization Formed—"100 per cent. Efficiency for 1915", Only Requirement for Membership—Reports for 1914 Show Increase in General Efficiency

The managers of the important branches of the Central Home Telephone & Telegraph Co. recently concluded their annual meeting at the offices of the company in Louisville, Ky., where they were congratulated for their efficient work of last year, given prizes for conspicuous accomplishments and where they organized a managers' club which is dedicated to make every activity of the representatives of the company contribute to the efficiency of the whole.

Twenty-three men, themselves managers of the principal offices or representatives of others, were in attendance at the convention, 35 exchanges in all being represented. Friday and Saturday, May 14 and 15, were given over to the sessions, the business of the two days being relieved by a theater party, automobile parties, etc. The managers were the guests of the Central Home company and made their headquarters at the Louisville Hotel, their business meetings being held at the Central Home offices.

Those present were: H. P. Myers, Bowling Green; M. M. Welch, Carrollton; C. M. Mynheir, Cynthiana; J. E. Chambers, Frankfort; J. G. Wingfield, Lawrenceburg, W. T. Black, Marion; J. C. Emerson, Mayfield; J. J. Lynch, Maysville; W. C. Corman, Carlisle; C. P. Short, Owensboro; A. S. Minor, Owenton; H. J. Jeffery, district manager, and K. E. Spears, Paducah; J. J. Veatch, district manager, Paris; S. H. Williams, Providence; C. L. Obinchain, Russellville; S. M. Heller, general manager; W. M. Brown, general auditor; C. M. Peklenk, traveling auditor; Minor Corman, general superintendent; B. Y. Chambers, assistant superintendent; W. M. Payne and J. H. Tyler, of Louisville.

Managers' Organization Formed.

"Efficiency" was the keynote of the meeting, and it was discussed from every conceivable angle and standpoint. The organization of the Central Home is "right up on its toes" and determined to make this year in all departments the best in the company's history. There was so much enthusiasm and earnestness evidenced by the men present that it became obviously and absolutely imperative to adopt some means to harness this team, to rope it in and get it under control. To this end the formation of a managers' organization to direct this enthusiasm was thoroughly approved and the name suggested by the general manager, S. M. Heller, the "I-Told-You-So Club," was adopted.

Membership in the organization was limited to those managers who were willing at this time to promise 100 per cent. efficiency in their fields for 1915 and who on the last day of next December will be able to say "I told you so." Needless to say every manager present was enrolled and the heads of the smaller offices will be added to the roll. The organization meeting was held at once and the following were elected: President, S. M. Heller; secretary, W. M. Brown; vice-president, Minor Corman; treasurer, C. M. Peklenk; publicity agent central district, B. Y. Chambers; western district, H. J. Jeffery; eastern district, J. J. Veatch.

A long list of slogans which had been submitted by men present was gone over and at length the following resolution was adopted: "Resolved that the slogan offered by S. M. Heller, 'Don't miss your chance,' be and is hereby adopted as the official slogan for the I-Told-You-So Club for the year of 1915 and that each member hereby pledges himself to the most efficient performance of the trust placed upon him and to hold before himself and his employes throughout the entire year or of 1915 this slogan as their watchword, to the end that the results obtained in all departments for the year may record 100 per cent. efficiency."

The meeting saw the award of the three cash prizes of the managers of the exchanges whose efficiency records for last year were very high. General Manager Heller, in making the awards, stated that he never had been confront-

ed with so difficult a problem as in deciding just which of the managers were entitled to precedence over the others. The work done in 1914 was most spectacular, in every department, as it showed not only 100 per cent. collections, an increase in the revenues, an increase in the business and a decrease in the expenses, but a general efficiency which was impossible to overlook. Every property in the system, he stated, was in a great deal better physical condition at the end of the year than it was at the beginning of the year, and in addition the improvement in the service, both local and long distance, was commented on very generally at every plant. Then the awards were announced and distributed as follows:

First prize, H. J. Jeffery, district manager, Paducah.

Second prize, H. P. Myers, manager, Bowling Green.

Third prize, J. J. Lynch, manager, Maysville.

It may be explained that these three men all worked against severe competition, and that it was the results they obtained in the face of this competition and the low cost at which they got results which won them their honors. In all of the exchanges 100 per cent. results were reported, but so exceptional was the record of these men that the managers of plants without competition hardly qualified for mention, in spite of the fact that they all produced wonderfully.

Another set of efficiency prizes was announced by Mr. Heller, on the principle that the earnestness was due in part to rivalry between the managers. This will terminate on June 30 and provides for a cash prize to the managers of every subdivision who report 100 per cent. collections for the first half of 1915. Judging by the way the reports are coming in to date, it is almost a foregone conclusion that every manager will be the recipient of a prize.

Among the speakers who addressed the managers present at the meetings was E. H. Cady, of Toledo, Ohio, secretary and treasurer of the Central Home Telephone & Telegraph Co., who spoke in a most complimentary way of the good work of the managers for last year. He stressed the fact that the watchword of the modern business world is "efficiency," and expressed his hearty approval of these get-together meetings in which managers can exchange ideas and compare results and thus broaden their own outlooks and increase their several capabilities. He observed that a man, in any line of business, who isolates himself becomes stagnant first and then retrogressive. After hearing Mr. Cady the managers adopted this resolution and adjourned:

"Resolved that the members of the I-Told-You-So Club do hereby pledge themselves to 100 per cent. collections for the six months ending June 30, 1915, and that they feel that whereas the offer of a cash prize for each plant for 100 per cent. collections for the six months ending June 30, 1915, is and ought to be an incentive, the honor and the distinction attached to the performance of their duties in a 100 per cent. manner, is of far more value than any mere monetary consideration which could be offered, and further that they owe it, not only to themselves, individually and collectively, to produce 100 per cent. results in every department, but that in appreciation of the treatment and the consideration which they have had at all times from their general manager, S. M. Heller, they could not in justice do less than show him that he has the most efficient telephone organization in the country."

Telephone Mergers at Texarkana, Weatherford and Houston.

The final consolidation of the two telephone systems in Texarkana, Texas, was recently effected, the Texarkana Telephone Co. taking over the properties of the Southwestern Telegraph & Telephone Co. in that city. The two systems will be operated from the Southwestern exchange at the corner of Third and East Elm streets. It is said there will be no advance in rates, the charge for the consolidation service being just what has been heretofore charged by each company. It is estimated that the consolidation will mean a saving of $15,000 annually to the telephone patrons. A. C. Stuart will remain in charge of the consolidated system. The total number of telephones now in service is placed at 2,800.

Plans are on foot for the merger of the local plants of the Southwestern company and the Home Telephone Co., in Weatherford, Texas. George S. Barcus, of Waco, president and majority stockholder in the latter company, has announced that he is willing to turn over its business to the Southwestern company, provided it can be fully reimbursed for the expense and outlay of the company's holdings in Parker county, where it controls a large majority of the rural telephones, although the Southwestern has the larger list of city subscribers in the city of Weatherford.

According to agreements following several conferences it it understood that the Southwestern company will also take over the properties of the Houston Home Telephone Co.

Heroic Efforts of Operators in Fire in Canal Zone.

The city of Colon, Canal Zone, Isthmus of Panama, was recently visited by a fire, as a result of which about 15,000 people were made homeless. While the fire was raging seven telephone girls in the Cristobal exchange were kept busy at record pace. The building, which is situated opposite the commissary, was practically the nearest building in Cristobal to the fire and from the windows the operators could see the terrible havoc the fire was causing and feel the awful heat. However, they stuck to their posts throughout and were kept busy putting through calls all the time. During the evening several of the switchboards gave out through the wires catching fire and at times it seemed that the building itself would become ignited. Captain Rose, head of the electrical division, under which the department of telephones and signals now comes, was present most of the time and did all that was possible in the matter. The names of the operators who were on duty, each of whom later received a letter from Governor Goethals thanking them and congratulating them upon the noble work they had done, are as follows:

Misses Lena Grace, Eleanor Minnick, Celia Gonzalez, Maty Clay, Sadie Gaynor, Nellie Passailaigne, and, last but not least, the chief operator, Miss Frances Lindner.

Census Report on Telephones Issued.

The U. S. census report on telephones and telegraphs for the year 1912 has just been issued by the Department of Commerce, Bureau of the Census, of which William J. Harris is director. The canvass for the collection of these statistics was started early in April, 1913, and the field work was completed by October, 1913. The U. S. totals were published in January and February, 1914, and a bulletin giving the principal data in regard to each branch was issued in June, 1914. It was therefore not thought essential to hasten the publication of the final report and only a limited force was employed in its preparation.

The statistics were collected and the report prepared under the supervision of William M. Steuart. Considerable of the data presented in the report has been published in TELEPHONY. Copies of the final report may be obtained from the superintendent of documents, Government Printing Office, Washington, D. C., at 50 cents per copy.

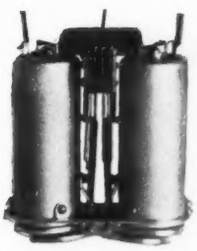
Intercommunicating System in Bowling Green, Ky., Hotel.

The Mansard Hotel Co., of Bowling Green, Ky., recently completed the installation of a private intercommunicating telephone system of the Stromberg-Carlson type. The equipment, it is said, is giving excellent service.

RURAL PARTY-LINE LOCK-OUT

FRANKLIN W. ADSIT

Inventor of the Adsit Telephone Lock-Out Perfected, 1914

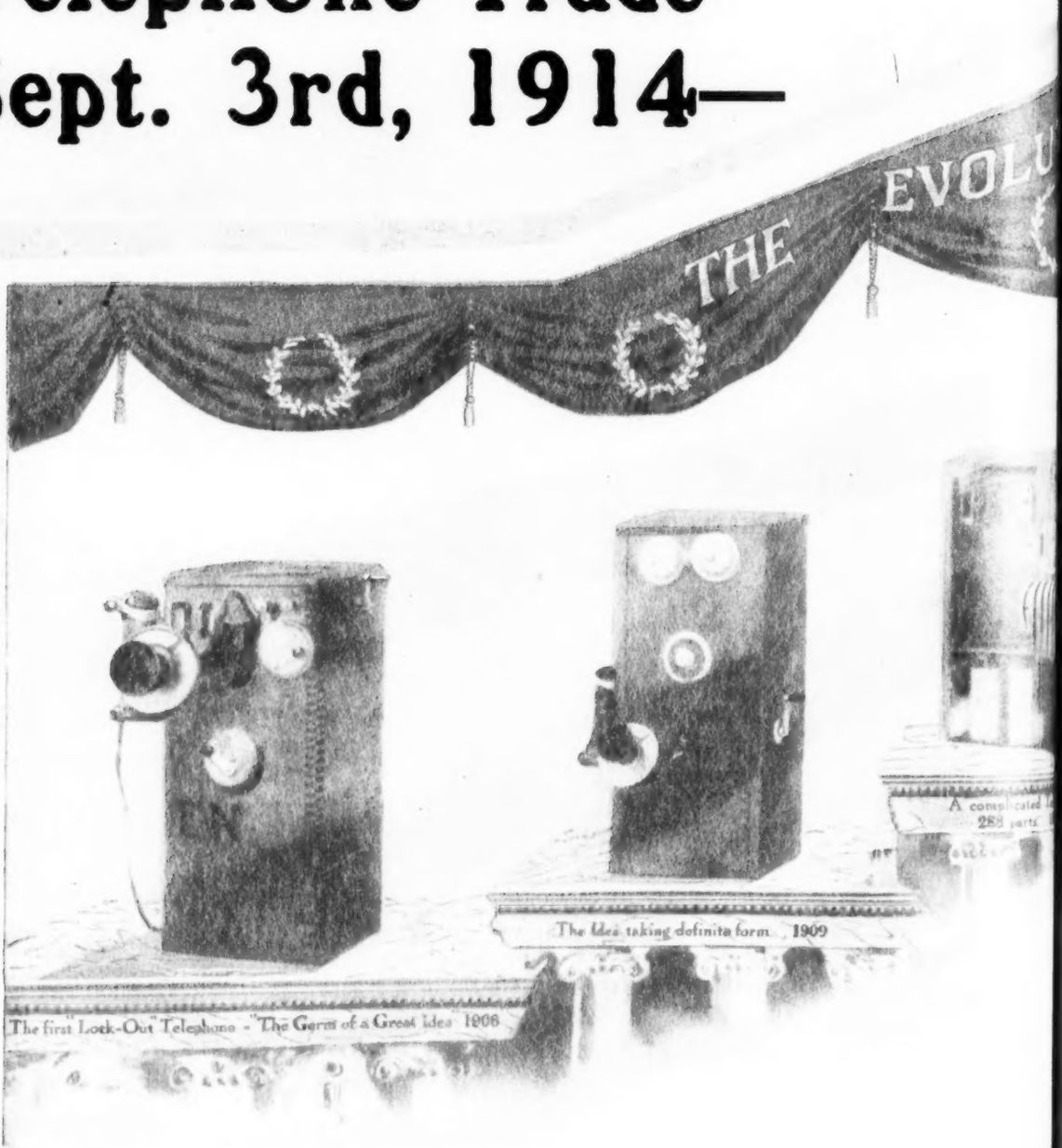


CENTRAL ENERGY LOCK-OUT (For City Lines)

The Telephone Sensa

A Wo

First Announced to the Telephone Trade Sept. 3rd, 1914—



ADSIT
REG. TRADE-MARK

A Record Unequaled in the H

on of This Generation

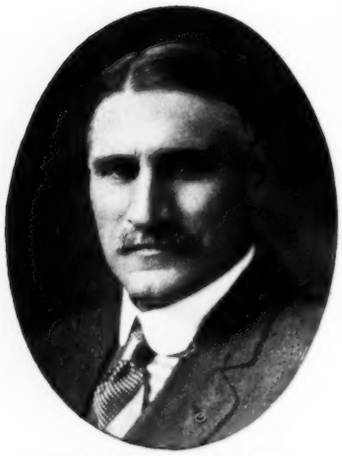
Record

ADSIT
REG. TRADE-MARK

—Six Months Later
March 3, 1915
over $339,879.00 worth of
ADSIT LOCK-OUTS SOLD

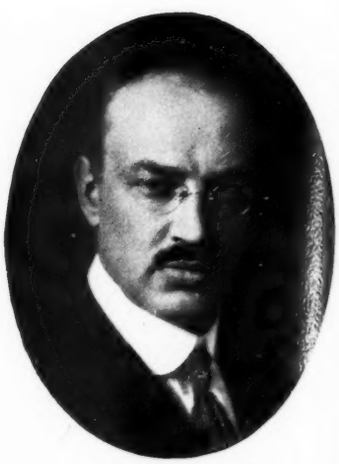
ory of the Telephone Industry

The Men Who Brought Out The ADSIT LOCK-OUT



GRANT E. ADSIT
Original Financial Backer of the Telephone Lockout "Idea"

THOS. W. HICKS
General Manager
The Man Who Puts the "ZING" in Adsit Advertising



C. D. ENOCHS
Chief Consulting Engineer of the Adsit Interests

ADSIT GENERAL ELECTRIC CO

MANUFACTURERS OF
THE ADSIT TELEPHONE LOCK-OUT ATTACHMENT

MINNEAPOLIS, MINN., U. S. A.

The May Season

Mere Bigness—Business and War Possibilities

By J. C. Kelsey

Some poet has sung about the merry month of May. May time has always been the season of song and frolic, with everyone light hearted, free and gay, for May is the connecting link of the confinement of winter and the freedom of summer.

It is hardly a time to record the greatest atrocity of history. Yet in this peaceful month, the world has received its greatest horror.

A boat sailed for England. It was a big boat, and from its proud peak floated the British flag—something which politicians tell us makes the world tremble and bow its knee to respect.

In the gigantic hold of this boat was nearly a million dollars' worth of war munitions—equipment designed to send Germans to the Happy Hunting Grounds. And on board were two thousand human beings, some visiting, some going home to join loved ones, some selling war material and others merely seeking excitement.

The Lusitania was a big boat. It was a gigantic water vehicle, a leviathan so designed that it compelled the respect of pampered men and women and, further, caused them not to be lonesome for the lights of Broadway. As was said of the Titanic—she could not sink.

You have heard it agreed that big business could not fail, that big business men have superior intellect and acumen and live and breathe in an atmosphere that you and I cannot understand.

All the skill of generations, all the experience of the sea-going world, had been expended upon this boat. She was perfect, just as all the financial skill of the world, the experience of ages, had been expended on the New Haven railway and other examples of industrial disasters.

The boat was a fast one, too. All the experience of the sea-going world had been applied to her lines and energies. She was the jack rabbit of the seas. Not having any more offensive power than the jack rabbit, she depended upon her sea legs to dodge danger.

Experts told us that a German submarine could not get close enough to see her. And if by chance this fast boat stumbled upon one, sleeping in her path, the exploding material would only scratch her sides, and the big boat would sail defiantly on. She was a *big* boat, consequently a perfect boat—and the band played on.

Somehow the plans of men "gang aglee." It is the unloaded gun that blows the head off the unsuspecting victim. It is the fireproof safe that seems most often looted.

The biggest bridge built by man fell into the river by its own weight.

The unsinkable boat carries the largest crowd to a suffocating death, and you need not be surprised when one of man's perfect big skyscrapers comes falling down with 5,000 human beings beneath its roof.

Thousands of years ago men thought they had achieved perfection. They preached new conceptions of ecomonics, believing they had reached the limit. Nations tried to grab all the trade of the earth. They massed great armies, and believed that mere bigness was the goal of the human race.

They became so satisfied with their size and perfection that they decided to build a tower designed to reach into heaven, and show their contempt for a creator they had outgrown. As a result tongues were twisted and men have suffered. They have passed through dark ages, and in the passing years have emerged, only to try to repeat the blunders of forgotten history.

Instead of a Tower of Babel, men have tried to build a tower of bigness. The nations of the world have no quarrel, except that of bigness.

This war is the natural outgrowth of the belief of men that bigness is necessary for the prosperity and happiness of a nation. Big business ideas naturally create big navy ideas and big army notions.

England distrusted the bigness of Krupps' industry, and Germany distrusted the motive behind England's financial bigness.

As a result of this industrial Tower of Babel, men of twisted tongues have relapsed into savagery. All the rules of civilized warfare have gone into innocuous desuetude.

Men in a single battle expend more powder than Napoleon used to conquer Europe. Submarines slink into the open sea and sink ships full of innocent people. Great big flyers drop explosives on the just and the unjust alike.

All this is being done simply because men thought that mere bigness was the goal of happiness. We surely are experiencing the confusion of souls, if not tongues, over this modern Tower of Babel, called industrial bigness.

We cannot say that the present horrors are new to American industry. American industry is acquainted with dynamite—have you forgotten how 25 innocent men in Los Angeles went to their deaths by means of a labor torpedo?

We are familiar with fire, arson, murder, intrigue, gunmen and violation of every rule of neutrality. We have seen just as many horrors as revealed by the sinking of the Lusitania.

We fully realize that things have been done in an industrial way in our dear land which would shame the untutored Indian who built a small fire on his enemy's stomach. So let us not pretend that we are unduly shocked over this great disaster. Surely governments can use the same weapons their subjects make use of in times of their disagreements.

It is said that politics never became rotten until shrewd business men got into it. And it is equally apt to say that war never became a real horror until business men got into it.

The Emperor of Germany is a business man, first of all, and so is the ruler of England, who has more business investments than he can count. After associating with shrewd business men for a lifetime, is it not natural that the crowned heads should put business principles into war? No wonder 42 centimeter guns are used. No wonder it costs $1,000 to shoot a big gun. Big business men never did care for expense if they could charge it to somebody else.

The inability of man to go so far and no farther is natural. If he goes farther some natural cause springs up to annihilate him.

H. G. Wells has a story about an attack from Mars.

The men from Mars, after landing, built towers which could walk, and from which there emitted a ray of light that destroyed life and property instantly.

No earthly weapon could resist the ray, and the men from Mars seemed to be marching upon London without resistance. But it was presently noticed that the attack stopped. Cautious investigators, after many days, found the Martians dead in their cells. They had been suffocated by unexpected atmospheric combinations.

Thus it seems that the affairs of men destroy themselves when they get beyond a certain stage.

In this country there is a demand for trouble. The real test of a war spirit is whether the individual himself is willing to go into the trenches or let someone else do it. It is well to advocate war if the other fellow will go and leave the widow for you to cheat.

Today men who have no notion of going themselves are advocating war and a defense of so-called honor. The question today is whether you will go yourself or send a son to death because a few people disregarded a warning and sailed on a hostile boat.

The Lusitania, after it left the three-mile limit from New York harbor, became as if on English soil. Would we go to war because some American tourist got in the way of a shell on Hill No. 60? The German government warned Americans not to sail, yet some Americans went aboard with a contemptuous laugh, just as nearly all men do when facing danger.

True, it is contrary to custom for a government to talk direct to the people of another government. It is equally true that Germany seems to have been hunting trouble with America, even before Admiral Dewey told the German admiral to behave.

It is equally true that England failed to protect the Lusitania when it reached the danger zone. Its route was well known, and the time for passing a given point was known to the minute.

Where was the largest navy in the world? Where was the convoy, which should have been there to take off the excited passengers? Where was the destroyer, which could have easily coped with the submarine?

The only answer is that both England and Germany want this country mixed up.

Who is making the loudest noise about our national honor and the loss of respect from other nations?

It never was fear and respect of England that made it safe for an Englishman in Berlin. In times of peace a South Sea Islander has the same right as a subject of a nation with a large chip on its shoulder.

We went to war with Spain because business was bad. There was a political promise to revive it. The country of Spain seemed to be lazy, and the loss of the battleship Maine made a good pretext.

Since that time we have never been able to prove that the boat was destroyed by Spain, much less by external explosion.

What do we care for the respect of a nation which will endeavor to starve the population of a country at war? What do we care for the opinion of a nation which deliberately torpedoes a passing ship, with men, women and children on board who never knew of the war? What do we care for a national honor in a brawl hardly less disgraceful than a saloon fight?

All we have to do is to attend our own business, encourage home industry, and entertain invaders who perchance may get the notion that we are an easy mark.

Every telephone man believes a sufficient navy is a good insurance—cheap, too—against any invasion prompted by big business men of other nations.

Every telephone man should take the lesson of bigness to heart. So many of us are prone to belittle our respectively limited fields. We make the mistake of comparing our conditions to the Bell company as a whole, and not to our neighbors. We have made a mistake of trying to grow big instead of strong.

I know of telephone companies that madly hustled for subscribers, and gave no thought to the net income. We all know of companies which have built into other men's territories and have laid the useless foundation of hate and mistrust. Just remember that control of the state is no more safe and comfortable than was control of the first county.

I believe that telephone men should stay in their own territory. I believe Americans should stay at home and keep out of war zones. We all have enough to do at home to keep us busy.

The woman in your town who leads the reform crusades has no time to take care of her home or children. The company which invades the territory of its neighbors without conscience, usually has tumbledown lines. And the nation, as a whole, has so much local housekeeping to do that it should not try to reform the world or worry over its rights.

Europe went to war to make business good. It is a cold business proposition. They forgot, possibly, that America would profit by their folly, and they have been quarreling with us ever since.

The Englishman sneers at our dollar-making tendency, when he knows that England loves a dollar more than its right eye. The German jibes at our money instinct, when he knows that money alone is the ambition of his empire.

So keep right on with the dollar-making idea—it helps to pay salaries and bond interest. Be not deceived by the wail of a newspaper editorial. After you get a look at the average newspaper editor, you will never be convinced.

We can trust the President. Let us hope he will not find it necessary to fight. A willingness to fight does not show what kind of a fight you can put up.

Ex-President Roosevelt is openly advocating war and ridiculing the present President. But was he brave when the United States Steel Corporation told him that the unlawful absorption of the Tennessee Coal & Iron Co. would stop a panic? What a plausible story they told him, and how silly it was to be led by it! A bigger emergency confronts us now, and we do not want another pitiful failure.

This is a time when the human race has gone mad. The tower of big business tried to reach into the heavens and show contempt for the creator of natural conditions. Tongues, souls, bodies, beliefs—all are in a confused mass. Let telephone men be more satisfied.

MORAL: America first.

Suggestion Slips and New Business.

A recent issue of The Telephone News contained some data relative to new business secured by the Lansdowne central office of the Bell Telephone Co. of Pennsylvania. From 35 suggestion slips turned in by the operator in charge $1,017 worth of new business resulted. In October last, the same operator turned in 14 slips and the new business obtained amounted to $339—the record amount of revenue secured by the suggestion slips of one employe.

The total amount of business secured during the month of October from this source, turned in by all departments, amounted to $1,779.

Proceedings Before Commissions, Courts and Councils

Discussions and Rulings of State Bodies Having Supervision of Telephone Companies, Decisions of Courts in Matters Affecting Public Relations of Utilities and Actions of City Councils Bearing Upon Franchises, Rates and Service

Chicago Council Begins Fight on Automatic Franchise.

After being asleep for four years in the council committee on gas, oil and electric light, the order which will begin suit by the city to forfeit the franchise of the Illinois Telephone & Telegraph Co., which operates the telephone properties of the tunnel company in Chicago, for its $4,000,000 automatic telephone system, was revived early this week.

There was a fight of an hour before the council authorized the corporation counsel to begin proceedings to enforce the ordinance which provides that the company's rights shall be annulled in case of failure to live up to the provision that it must serve at least 20,000 subscribers.

Injunction proceedings will meet the first attempt of the city to push the forfeiture suit, according to legal representatives of the telephone company. It is their contention that the city is seeking confiscation of the automatic system in order that they may obtain it without cost and that the Penny Phone League is backing the fight. They declare they have made every effort to be heard by the gas, oil and electric light committee for two years, but without success. It has been the proposal of the Illinois Telephone & Telegraph Co. to sell the telephone system to the American Telephone & Telegraph Co. for more than $6,000,000.

By its action council rode rough shod over the opinion of former Corporation Counsel W. H. Sexton, that the forfeiture clause of the franchise was ineffective, and likewise over the contention that forfeiture would be confiscation.

Corporation Counsel Folsom was accordingly directed by the city council to proceed at once to forfeit the telephone rights and properties of the Illinois Telephone & Telegraph Co.

With reference to the proposed forfeiture of the automatic plant President B. E. Sunny of the Chicago Telephone Co., speaking as a director of the American Telephone & Telegraph Co., says:

"The threatened forfeiture by the city of the automatic telephone franchise does not, in my opinion, interfere at all with the American company's proposition to acquire the automatic property.

The A. T. & T. Co.'s agreement to take over the automatic company was subject to its getting the necessary municipal government consent. Thrashing out this question is really necessary to determine the title to the property. The city council's action looks drastic, but since the automatic franchise ordinance contained a paragraph providing for the forfeiture if the company failed to show 20,000 bona fide subscribers, I regard it as in the line of orderly examination of title by court procedure which probably will merely delay our transaction. I do not know what proposition, if any, the American company would make to the city in case the court sustains the forfeiture of the Illinois Tunnel Co.'s automatic telephone property."

Hearing on Investigation of Free Service in New York.

The New York Public Service Commission has adopted strong means to check the use of free telephones and other service including that of pay stations contrary to telephone tariffs. The offending companies in western New York were recently brought before the commission and given two weeks in which to better the conditions complained of.

In many places free telephones have been given to local officials and persons of prominence, in some places entire exchanges for giving free service in violation of law, and pay stations were shown to be giving local service without charge. This has resulted not only in violation of the law against free telephones but in discrimination.

The matter has been taken up informally with the Federal Telephone & Telegraph Co. without result. The New York Telephone Co. has been ordered to explain whether or not this number of pay stations in western New York is in excess of that reasonably required for the public convenience and whether this practice results in discriminatory rates.

Among the towns and exchanges affected are those of the Federal Telephone & Telegraph Co., at North Collins, Wellsville, Medina, Arcade, Hamburg, East Aurora, Belmont, Pike and Attica.

The companies have been served with the particulars which the commission alleges to be irregular and must appear at another hearing on May 26.

Cost of New York Telephone Rate Investigation.

The New York Public Service Commission has made its final return on the expense to the state of the investigation of the New York Telephone Co. Of an appropriation of $100,000 given the commission by last year's legislature the commission has now returned $56,567. The total expense for the examination of the New York Telephone Co.'s $84,000,000 property and its $10,000,000 yearly revenue, resulting in a saving of $3,000,000 a year to the telephone subscribers of the city of New York was thus but $43,433.

The items included in this sum are for salaries of engineering and accounting forces, $31,272; for traveling expenses, $1,852 (including the necessary trips of the commissioners to New York City for the large number of hearings); for equipment, $2,131; for supplies and miscellaneous expenses, $657, and for the services and expenses of Special Counsel Martin W. Littleton, $7,521.

Hearing on Maryland Telephone Rate Investigation.

A change in procedure was agreed upon by Attorney Osborne I. Yellott, for the Maryland Public Service Commission, and Attorney R. V. Marye, for the Chesapeake & Potomac Telephone Co., at the hearings held last week, in regard to the presentation of facts before the commission in the hearings to determine the physical valuation of the telephone property in Maryland. The plan is as follows:

That instead of the commission giving two decisions, one on the value of the tangible and intangible assets and another on the earnings of the company as compared to its total value, the decision on the first named should be withheld until the investigation of the earnings is completed. Then the commission will decide as to the valuation and whether these earnings gave a fair or unfair return on the capital represented.

By this means it was believed that a better understanding would be arrived at and the work in both cases expedited.

W. W. Anderson, expert engineer for the commission, was then placed on the stand and the matter of depreciation taken up. He submitted voluminous estimates to show that the present depreciated value of the physical property of the telephone company was $9,499,000. This figure was arrived at by his own estimates of how much the property deteriorated each year. If he took the company's percentage

of depreciation, he said, the present value would be shown to be only $8,830,000, because the company allowed only nine years as the life of central office equipment, while he figured this life at fifteen years.

Mr. Whittemore, engineer for the telephone company, stated that the figures used by Mr. Anderson as "the company's" figures were not applicable to actual deterioration of property, but were merely the estimated percentage which the company thought necessary to put aside to care for the future. When these figures were found too low, he said, they were increased, and when too high they were decreased.

According to Mr. Anderson the company should have at present a fund of $2,813,000 to take care of depreciation. Mr. Marye, however, said that the actual fund was only about $1,500,000.

Protested Rate Increase Approved by Commission.

The Nebraska State Railway Commission has finally rendered a decision in the case of W. J. Marquis vs. the Polk County Telephone Co., of Stromsberg, Neb. The case was filed in December, 1912, the plaintiff protesting against the increase in business rates from $1.50 to $2.50 per month, no change having been made in farm or residence telephones. After making a thorough investigation the commission rendered its opinion, in which it declares that the increase in business rates is justified, but appends a rider that the company shall set aside annually 10 per cent. of its earnings for a depreciation fund, until further ordered.

It was found during an investigation of the case that in ten years the company had put on the average only 6.6 per cent. into repairs and maintenance, whereas it is found that 8 per cent. is the proper depreciation charge. At the same time it was paying excessive dividends and permitting the plant to run down. During the years 1914 to 1907 the quarterly dividends varied from 3.3 to 7 per cent., but that since 1907 the quarterly dividend has not exceeded 2 per cent. The average for the decade has been 9.52 per cent. or considerably more than the commission believes ought to be earned.

From this depreciation fund the plant is to be built up to 100 per cent. efficiency, after which further readjustment may be made. With a 10 per cent. depreciation allowance it is found that the company, with the increased rate can earn 5½ per cent. on the scheduled valuation found by the commission, and that if the regular 8 per cent. is allowed the earnings would be 7½ per cent. per annum.

Must Successor Comply With Agreements of Predecessor?

The complaint of John A. Knott, B. E. Hixson and Joseph O'Hern against the Southwestern Telegraph & Telephone Co., was heard last week by the Missouri Public Service Commission.

At the time the Miller Township Telephone Co. sold out its Hannibal franchise and telephone exchange to the Equitable Construction Co., in 1902, the latter company agreed in a contract as a part of the consideration to furnish the stockholders of the Miller Township Telephone Co., residing in Hannibal, free or prepaid telephone service during the life of the Miller township company's franchise which expires in April, 1921. This contract not only bound the Equitable Construction Co. to render such service, but also its successors and assigns.

Such service, it was stated at the hearing, had been rendered by the several companies which have succeeded the Equitable Construction Co. at various times until September, 1914, when the Southwestern Telegraph & Telephone Co. served notice on the complainants that such service would be discontinued unless they signed contracts for telephone service in which they would agree to pay certain rental charge. Thereupon the complainants filed a complaint with the Missouri Public Service Commission asking for a ruling which would enforce the rights under the contract in question and compel the Southwestern company to continue to furnish the service as provided for in the original contract.

Both sides have been requested to file briefs with the commission after which a decision will be rendered.

Charges for Service in Residence of Doctor.

In a complaint recently heard before the Ohio Public Utilities Commission, Dr. F. E. Plummer alleged that the United Telephone Co. had refused to install a telephone in his residence, except at the regular rate for business service. He further alleged that he had an office in certain rooms in his residence, but did not care for a telephone to be used in his business; that his wife was the owner of the residence and desired the telephone for residential purposes only. The complainant asked that a telephone be installed in his wife's name at residential rates. The wife not being a party to the proceedings, the commission dismissed the complaint.

The commission, however, is of the opinion that should the wife of the complainant apply to the defendant company for the installation of a telephone in her residence, to be used by herself and family for ordinary purposes, that she would be entitled to such service at the rates prescribed in the company's schedule for residences, regardless of the fact that her husband, the complainant, maintains his office in the same building. This rate should only be extended to the complainant's wife so long as the use of the telephone is absolutely for such purposes as indicated, and not for her husband's use for professional business, and should the complainant use the telephone for professional communications the defendant company shall have the right to charge the business rate therefor or disconnect the instrument.

Restricting Use of Stock by a Shareholder.

No by-law of a private corporation which pretends to restrict the ability of a stockholder to sell his stock, except as is prescribed by Kansas law, is valid. This is the ruling handed down by the supreme court of Kansas, on May 18, granting the application of A. S. Steele, president of the Consolidated Telephone Co., of Norton and Oberlin, for a writ of mandamus against the Farmers & Merchants Mutual Telephone Co. to compel that concern to register a block of stock owned by him.

Mr. Steele admitted that he had bought stock in the Mutual company in the hope of consolidating that organization with his own corporation. The directors of the Mutual company got behind certain by-laws of the corporation, and refused to register Mr. Steele's stock, so he could vote it. The supreme court came to Steele's relief by declaring the Mutual company could not hinder his use of the stock so long as he had complied with the state law in offering it for record on the company's books.

Small Companies Not Exempt From State Supervision.

The Wisconsin Assembly early this week killed the Laursen bill providing for the exemption of small telephone companies from the supervision of the state railroad commission. This was in accordance with the committee's recommendation and was marked by no debate.

Telephone Plants at Roachdale, Ind., to Consolidate.

Negotiations have been completed by J. W. Miller and J. R. Britton for the consolidation of the plants of the Roachdale Union Telephone Co. and the Citizens Telephone Co., in

Roachdale, Ind. The two companies which have been operating in competition for eight years, will now be combined and the business conducted from one switchboard.

Senate Committee Opposes Telephone Inquiry.

The Senate ways and means committee of the Massachusetts legislature has reported "ought not to pass" on the House resolve, recommending the appropriation of $15,000 for an investigation of the rates and services of the New England Telephone & Telegraph Co. by the public service commission.

Summary of State Commission Hearings and Rulings.

ARIZONA.

May: Application filed by the Navajo-Apache Telephone System, of Holbrook, Ariz., for permission to transfer from a copartnership to a corporation under the title of the Arizona Electric Telephone Co. Application of the new company for permission to issue 24,985 shares of capital stock of a par value of $1 has also been filed with the commission.

May: Messrs. Minor and Grosty, of Winkelman, Ariz., authorized to purchase the Winkelman exchange of the Mountain States Telephone & Telegraph Co.

CALIFORNIA.

May: Application filed by the Santa Paula Home Telephone Co., requesting authority to effect a consolidation with the telephone system of the Pacific Telephone & Telegraph Co. in Santa Paula, Cal., and to purchase a portion of the Santa Paula exchange plant of the Pacific company for a consideration of $25,400, to be evidenced by the issuance of its two-year 6 per cent. note.

May 18: Hearing in regard to complaints against the Pacific Telephone & Telegraph Co., at Sacramento, Cal.

ILLINOIS.

May 18: Hearing of complaint of the Wayne County Mutual Telephone Co. and the Business Men's Commercial Club, of Fairfield, Ill., against the Commercial Telephone & Telegraph Co., of Olney, in regard to charges and insufficient service in Fairfield and vicinity and asking that the petitioners be granted a certificate of convenience and necessity to establish in Fairfield another service.

May 18: Hearing on complaint of the Farmers' Mutual Telephone Co., of Lostant, Ill., vs. the Central Union Telephone Co., the Tonica Telephone Co. and the Central Illinois Independent Telephone Co., of refusal of defendant companies to receive and transmit messages from complainant company; also complaint of discrimination of defendant companies in favor of other companies as against complainant.

May 18: Hearing on complaint of E. F. Colwell, of Mt. Auburn, Ill., against W. P. Elliott, president of the Illiopolis & Christian County Telephone Line No. 56 as to defendant's detaching side line of complainant at junction with main line and failure to put in new line.

May 18: Hearing on complaint of the Waverly (Ill.) Telephone Co. against the Chesterfield Telephone & Telegraph Co. on refusal of defendant company to receive and transmit messages at its exchange in Chesterfield, which originate on lines of complainant company; also as to division of toll, revenue, etc.

May 18: Hearing on application of the Chesterfield Telephone & Telegraph Co. for authority to change telephone rates at Rockbridge, Ill., and vicinity.

May 19: Hearing on application of the Liberty Farmers' Telephone Exchange for permission to change telephone rates at Liberty, Ill., as between stockholders and subscribers and rural switching service.

May 19: Hearing on application of Forest City Telephone Co. to change rates as to subscribers and stockholders at Forest City, Ill.

May 19: Hearing on application of London Mills Telephone Exchange for authority to change telephone rates as between stockholders on rural lines who own their telephones and renters at London Mills, Ill.

May 19: Hearing on application of reorganization committee of the Western Illinois Telephone Co., of Macomb, Ill., against the Independent Switchboard Co., of Elvaston.

MASSACHUSETTS.

May: Petition filed by the Automatic Telephone Co., of New Bedford, Mass., for permission to increase its capital stock from $100,000 to $150,000, by an additional issue of 1,000 shares of a par value of $50, to be offered to stockholders on the basis of one share for every two shares now held. The proceeds are to be spent on additions to the company's plant.

MISSOURI.

May 13: Wm. Stehle authorized to sell and W. N. Stehle authorized to buy one-half interest in the Perry Telephone Co., of Perry, Mo.

May 13: Hearing on the complaint of John A. Knott, B. E. Hixson and Joseph O'Hern, of Hannibal, Mo., vs. the Southwestern Telegraph & Telephone Co., in which the complainants ask for a ruling requiring the defendant to enforce the rights of a contract made with its predecessor company and continue to furnish them free service as provided in the original contract.

NEBRASKA.

May: The commission has rendered a decision in the case of W. J. Marquis vs. the Polk County Telephone Co., of Stromsburg, Neb., in which the plaintiff protested against the increase in business rates from $1.50 to $2.50 per month. The commission held that the increase is justified but ordered the company to set aside a depreciation reserve of 10 per cent. of its earnings.

May: The commission granted the application of the Lincoln Telephone & Telegraph Co., of Lincoln, Neb., for permission to use its own switchboard and to trunk across a connection with the board of the Farmers Independent Telephone Co., of Red Cloud, Neb., instead of running its toll lines in on the board of the Farmers company, as per an agreement made in 1910.

NEW YORK.

May 21: Hearing at Buffalo, N. Y., on the complaint of F. M. Bradley, of Barker, Niagara county, and the West Somerset Cold Storage Co., Inc., vs. the New York Telephone Co., as to rates and service.

May 26: Hearing in regard to investigation instituted by the commission into free service practice of the New York Telephone Co. and the Federal Telephone & Telegraph Co., in western New York, including that of pay stations.

OHIO.

May 13: The commission dismissed the complaint of Dr. F. E. Plummer vs. the United Telephone Co., in which he alleges that the defendant has refused to install a telephone in his residence except at the regular rate for business service. Although he maintains an office in his residence, the complainant alleges that he does not desire the telephone for his own use but asks that it be installed in his wife's name for residential purposes only. His wife not being a party to the proceedings, the complaint was dismissed.

OKLAHOMA.

May 17: Postponed hearing on numerous complaints of Independent telephone companies of Oklahoma against the Pioneer Telephone & Telegraph Co., alleging inequitable distribution of long distance revenues.

OREGON.

May: Western Telephone Co. authorized to increase its rates at Hubbard, Ore., to approximately double its former schedule, upon condition that it give a 24-hour service instead of a 14-hour service.

PENNSYLVANIA.

May: Application filed by the Blue Mountain Telephone & Telegraph Co., of Bangor, Pa., for permission to buy and the Easton & Bethlehem Telephone Co., of Easton, Pa., for permission to sell its properties to the former company.

SOUTH DAKOTA.

May 19: Hearing at Frankfort on complaint of H. H. Motley vs. the Dakota Central Telephone Co.

June 2: Hearing at Hill City, S. D., in regard to an investigation of the new schedule of rates filed by the Nebraska Telephone Co., for its Hill City exchange on February 3 and suspended by order of the commission on March 1.

WASHINGTON.

May 15: Hearing on the valuation of the properties of the Pacific Telephone & Telegraph Co. in the state of Washington. On the valuation to be fixed, as a result of this hearing, telephone rates, both for exchange and toll service, will be based.

WISCONSIN.

May 19: Hearing in regard to application of the Lebanon (Wis.) Telephone Co. for authority to increase rates, tolls and charges. U.—786.

May 27: Hearing in regard to application of the Random Lake (Wis.) Telephone Co. for authority to increase rates, tolls and charges. U.—789.

"Telephony's" Home Study Course for Telephone Men

A Complete Presentation of the Principles Underlying Modern Telephony in All Its Branches—Arranged Systematically So That Regular Reading and Faithful Study Will Qualify Ambitious Men for Higher Positions—Prepared Under Supervision of Stanley R. Edwards—This Section Written by Jay G. Mitchell

Quiz Questions on the Preceding Installment.

The answer to these questions will be found in the reading section bearing the same number. Answers are not to be sent to TELEPHONY for criticism. For the benefit of those desiring the advantages of a correspondence course, the Engineering Extension Department of the Iowa State College has volunteered to answer questions and criticize replies to questions and solutions of the problems which will be presented from time to time in connection with the course. No charge will be made for this service and the offer applies to all subscribers of TELEPHONY regardless of whether they live in Iowa or elsewhere. Correspondence should be addressed to the Engineering Extension Department, Iowa State College, Ames, Iowa.

113. How does the use of the induction coil enable us to maintain a constant resistance in the battery and transmitter circuit?

114. Why has the secondary winding of the induction coil more turns than the primary?

115. What is the effect produced by the greater number of turns in the secondary of an induction coil as compared with the number in the primary?

116. Give the reasons for the use of the induction coil.

CHAPTER VI. The Magneto Set (Continued).

117. *The generator.* In sections 84 and 85 the theory of the generator was briefly touched upon. In order to arrive at a complete understanding of the factors which determine its design, further consideration is necessary. In Fig. 43 is shown in theory the arrangement of the armature and pole pieces, with a view of the armature core having a few turns of the winding in place. We have seen how an alternating electromotive force will be produced in the winding as the armature is rotated around its shaft between the pole pieces. It will be remembered that this alternating electromotive force is due to the cutting of lines of force by the turns of the armature winding. While the voltage produced is alternating in character, it is possible to measure it, although its value continually fluctuates between zero and a positive and negative maximum. The effective voltage, which is always meant when reference is made to the voltage of alternating current is the voltage of a uniform direct current which would produce the same effect in a circuit having the same resistance effect as it opposed to the alternating current. Inasmuch as the voltage is at times equal to zero, it is evident that at other times it must reach a value higher than its effective value, expressed in volts, would indicate. This is very true and will serve to explain why an alternating current is a more severe test on the insulation of a telephone circuit than a direct current of the same nominal voltage. As a matter of fact the alternating voltage known as 110 at times reaches a value, for a very short period of time, of 155 volts. In a later section the theory of the rise and fall of this alternating voltage will be fully discussed.

118. *Effective voltage.* The voltage of the alternating current produced is dependent upon the *rate* per second of the cutting of lines of force. If the number of lines of force is fixed, the voltage depends upon the number of turns in the winding and the speed of cutting. If the speed of cutting is fixed, the voltage depends upon the number of lines of force to be cut and the number of turns in the winding. Therefore there are three ways in which the voltage delivered by any design of generator may be varied. They are:

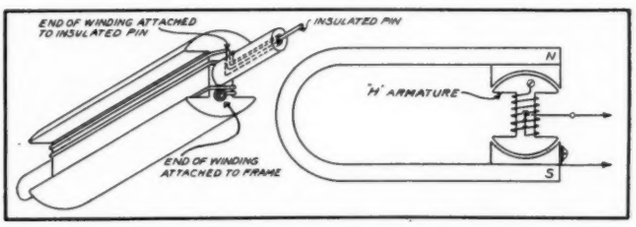


Fig. 43. Armature and Arrangement of Generator Parts.

First, by varying the number of lines of force to be cut. In the telephone hand generator this would involve the addition or withdrawal of permanent magnets to increase or decrease the total number of lines of force with a consequent adaptation in the length of pole pieces, armature and mounting.

Second, by varying the number of turns in the armature winding, the speed and number of lines of force remaining the same.

Third, by varying the speed of rotation, the number of turns and number of lines of force remaining the same.

Taking these methods in order, let us suppose that we add another permanent magnet to a three-bar generator, lengthening the pole pieces and armature to provide the necessary width for the increased number of magnets. This is shown in plan in Fig. 44 where Fig. *A* represents the sectional view of the magnetic field of a three-bar generator and Fig. *B* that of a four-bar generator. The section of the lower ends of the magnets are numbered, for clearness, 1, 2, 3, and 4. The additional magnet in Fig. *B* will add its quota of magnetic lines to the field of the generator. The number of magnetic lines of force per square inch in the field of practically all the hand generators on the market is approximately 25,000.

In adding the magnet to the three-bar generator of Fig. 44, it is necessary to increase the length of the pole pieces and

the armature core. It will accordingly require a greater *length* of wire to place the same number of turns on the longer armature core. Assuming that the wire used is of the same gage as the original winding in the three-bar generator, it is clear that its total resistance will, owing to the increased length, be higher than before. The winding of the armature is a part of the circuit in which the current generated must circulate. Therefore, by an application of Ohm's Law, it is very clear that any increase in resistance of the armature winding must be carefully considered. If it is too high, all advantage due to the increased voltage obtained will be lost through the greater resistance in the armature winding itself. If the gage number of the wire is reduced the larger wire may, on the other hand, seriously reduce the number of turns possible in the winding.

It is possible in this way to lose all advantage in the way of increased number of lines of force to be cut by the coil by the reduction in the number of turns in the armature winding. Moreover it is desirable to increase the current output of generators designed for heavy party line duty. This is because the ringers on a party line are in parallel across the circuit and each one requires its quota of current in its windings. This requirement calls for greater current carrying capacity in the armature winding and also the proper number of turns to give the necessary voltage from the greater number of lines of force in the generator field. It is usual, therefore, to increase the size of the wire as magnets are added. This makes it possible to wind fewer turns. Nearly all manufacturers also increase the diameter of the armature as the number of permanent magnets is increased. By adding magnets to the generator, increasing the size of the wire in the armature winding and reducing the number of turns, the voltage required is assured without reduction while the current output in amperes is increased. The current output is increased by the lower resistance of the larger size wire used, while the additional magnet supplies lines of force to be cut, counteracting the effect of the reduced number of turns in the armature winding.

By increasing the speed of rotation, more lines of force will be cut *per second,* increasing the voltage delivered. The speed of rotation of the armature is fixed in practically all telephone generators at about five turns of the armature to one turn of the crank shaft. Experience has shown that this gives a speed of about eight turns of the armature per second

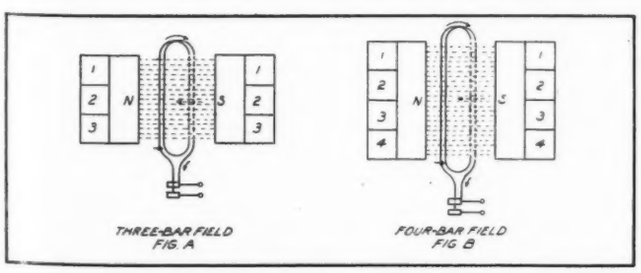


Fig. 44. Magnetic Field of Magneto Generator.

when in ordinary use. At this speed the average four-bar generator will deliver a voltage of from 30 to 50 volts. The output of a good generator with five permanent magnets is about 2.5 watts when turned at about the average speed. The winding data for a well known line of telephone generators is given in the following table:

Number of Bars	Resistance	Turns	Diameter of Armature	Wire Used
3	500 ohms	3,100	1½ inch	*36 S.S.
4	250 ohms	2,800	2 inch	32 S.S.
5	160 ohms	2,000	2 inch	30 S.S.

*Single silk insulation

119. *Eddy currents.* Suppose that in addition to the winding of the armature itself we consider the iron core.

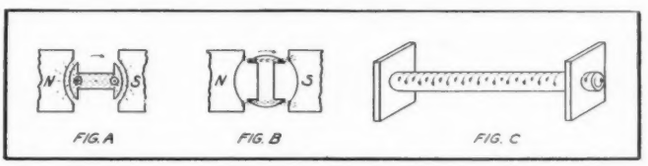


Fig. 45. Eddy Current Conditions in Generators and Coils.

If this core should be made from one solid piece of iron it would be strong, durable and easily machined. It would also constitute a path of very low resistance for electric currents, provided any should be generated in its own mass. Consider for a moment the effect of turning an iron armature core in the field of a magneto generator, leaving out of consideration the winding. This condition is shown in Fig. 45. In the position shown in Fig. *A* the permeability of the magnetic circuit is at a maximum. When the armature has assumed the position shown in Fig. B the reluctance of the magnetic circuit is greatly increased and the number of magnetic lines of force threading the iron of the core is reduced. Therefore, if we consider the iron of the core itself as a loop circuit of very low resistance it will be plain that the magnetic lines of force will be withdrawn from such a loop and reinserted as the armature is revolved on its axis. By an application of Fleming's rule as to the direction of the induced electromotive force, we shall find that this will result in the production of currents running *lengthwise* of the armature through the iron. Under the conditions shown in the illustration the currents in the iron in Fig. *A* will pass away from the observer on the left hand side of the armature core and approach the observer on the right hand side. It is perfectly obvious that with an armature core made from solid iron there is nothing to prevent the flow of currents of this character. It is also obvious that such currents are not available for any useful purpose. In fact, their sole effect is to consume power and to heat from the iron of the armature.

There is one other place in telephone apparatus where the production of eddy currents must be prevented. Let us suppose that the core of the telephone induction coil be made from a solid rod of iron. Such a core would constitute an innumerable number of paths for currents to circulate *around* its center, as shown in Fig. 45-*C*. In other words, whenever the disturbance of the magnetic flux in the core occurred under the influence of the primary winding and the transmitter, a set of *eddy* currents would be produced in the solid iron core. It is necessary to prevent such a condition, as these eddy currents would not be of any value in the transmission to the distant station, but

would absorb some of the useful magnetizing power expended in the primary circuit.

In order to prevent this effect the core is made of a number of small iron wires instead of one large rod. These iron wires are not cleaned, and the scale adhering to their

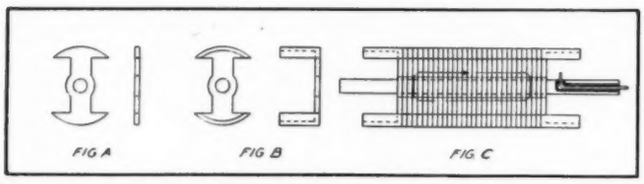


Fig. 46. Generator Armature Construction.

surface constitutes an effective insulator to prevent the *eddy* currents from circulating from one wire of the core to the next, as the voltage of the eddy currents is very low. The reason the voltage of the eddy currents is low is because there is *only one turn* in the loop formed by the material of the core. By preventing the circulation of these eddy currents practically the entire effect of the primary circuit is exerted in the secondary winding on the voice transmission currents.

Now consider for a moment the generator armature core. If it should be made from separate sheets placed crosswise on its shaft it would not be possible for *eddy* currents to flow through it in a lengthwise direction. This is exactly the expedient devised to accomplish this effect. The armature core is composed of stampings similar to those shown in Fig. 46. Fig. *A* represents one of the stampings used in the central part of the core, and Fig. *B* the stampings used for the end pieces. The complete armature core is shown in Fig. *C*, and it is very clear that no *eddy* currents will flow in the direction show by the arrow. By this means the entire effect of the magnetic lines of force in the generator field is confined to the production of current in the winding. Originally, magneto hand generators were equipped with armature cores made from one solid mass of iron, but the present practice is to use a *laminated* construction as illustrated.

(*To be Continued*)

Accounting Systems Prescribed by Interstate Commission

Authority and Jurisdiction of Interstate Commerce Commission over Accounts of Telephone Companies—Personnel of Commission and Importance of One Member Being a Telephone Man—Paper Presented at Convention of Tri-State Independent Telephone Association

By LeRoy Parker

The "Act to Regulate Commerce," approved February 4, 1887, authorized the creation of the Interstate Commerce Commision and gave it jurisdiction over "common carriers engaged in the transportation of passengers or property wholly by railroad, or partly by railroad and partly by water" from one state to another. The original act gave the commission limited authority as to accounts. This was extended by amendment in 1906, and beginning with 1907 has, by successive stages, gone into effect.

By the amendment of June 18, 1910, telegraph, telephone and cable companies (whether wire or wireless) engaged in sending messages from one state to another state, were brought under the act. The Interstate Commerce Commission thereby was given the same authority with respect to accounts of telephone companies as it had previously with respect to railroads.

Power of Interstate Commerce Commission.

The commission may prescribe the forms of any and all accounts, records and memoranda, and at all times have access thereto. We find, therefore, that the Interstate Commerce Commission is vested with the power to regulate the method of accounting to be used by telephone companies. It obtains this authority because telephone companies are regarded as common carriers in that they originate or transmit interstate toll messages. The few exceptions to this are where exchanges have stations which extend into adjoining states. With the exception of those companies which have no interstate toll connection—and the number of these must necessarily be few—all telephone companies are subject to such systems of accounts as may be prescribed by the Interstate Commerce Commission.

When we further consider that the scope of regulatory power in the hands of the Interstate Commerce Commission, insofar as it relates to the revenues of telephone companies, is limited to only such revenues as are obtained from interstate toll business—which is hardly in excess of one or two per cent. of the total volume of revenue—the obvious conclusion would be that its absolute control of accounting matters is not in conformity with the very small part of operations which comes under its jurisdiction.

However, regardless of such seeming incongruous disposition of authority, it is safe to say that the benefits to telephone companies derived from the uniform systems of accounts, effected through the power conferred upon the Interstate Commerce Commission, demonstrate incontrovertibly the wisdom of such authority, for it is hardly possible that in any other way could uniformity in accounts have been accomplished. This surely could not have been done through the several utilities commissions of the different states. This is aptly illustrated by the fact that the Wisconsin and Oklahoma commissions have prescribed systems of accounts at total variance with those either prescribed or recommended by commissions of other states. This fact, in itself, convinces me that accounting systems for all companies should be uniform and thus comparable. Consequently they should be prescribed from one source and that source should be the Interstate Commerce Commission.

The systems prescribed by this commission should contain all features of merit which may be advocated by the several state utility commissions. Certainly the Interstate Commerce Commission should not, even if it may legally do so (which is questionable), delegate any part of this authority to other commissions. While many of us may think that the present systems of accounts, as prescribed, should be changed in many respects, yet telephone accountants feel that the present systems are, at least, steps in the right direction.

It is a matter of history that during the 30 years following the first use of the invention, little or no progress was made in advance accounting in its relation to telephone operations. While it is probable that accountants of the larger companies realized that the best results could be obtained only through uniform accounting, nothing was accomplished to that end. However, in 1907, C. G. DuBois, comptroller of the American Telephone & Telegraph Co., very ably devised and installed a uniform system of accounts for all of the Bell companies. This task was regarded by accountants as a great achievement and the pre-eminent ability thus displayed, obtained immediate recognition for Mr. DuBois as the leading telephone accountant.

When we speak of the present systems of accounts adopted by the Interstate Commerce Commission and prescribed for Class A and B companies, effective January 1, 1913, it should be borne in mind that they are merely adaptations of the Bell system of accounts, with amendments of greater or less importance.

Responsibility of Accountants.

The responsibility and the personal accountability on the part of the accountant is forcibly set forth in the opinion of the Interstate Commerce Commission No. 933, as follows:

The formative period to which we have referred must now be considered as having come to an end, so far as all the important principles and requirements of our regulations are concerned, and we shall hereafter expect a more exact observance of the prescribed accounting systems by the carriers and their officials. Accounting officers understand the true functions of accounts and realize their importance in determining the correct economic condition of the transportation properties with which they are affiliated. Their instincts and training are such as naturally to lead them to keep their accounts as they should be kept. They would not have the confidence of their superior officers if this were not the case. But in many instances the accounting officers of carriers have not been left free to follow their natural inclinations in this regard. Irrespective, however, of the influences brought to bear upon an accounting officer to turn him from his true course as an accountant and from his duty, under the law, of keeping the accounts in accordance with the system prescribed by the commission, it is nevertheless his hand, or the hand of some one immediately under his authority, that makes the wrongful record, and it is the accountant, therefore, to whom the commission must look in the first instance for the proper carrying out of its rules and regulations.

Under our regulations and prescribed form, the oath of the accounting officer must be attached to the annual report of the carrier to the commission, together with that of the executive; and, from the necessities of the case, it is the accounting officer who is immediately responsible and whom the commission will first hold responsible when it becomes necessary to invoke the penalties of law; but we shall not hesitate to call to account, with even greater severity, anyone above the accounting officer in authority who may share in the responsibility for any violations of the accounting rules and regulations which have been prescribed for the use of the carriers that are subject to the act.

Through publicity, and publicity alone, can the confidence of the public be obtained and new capital enlisted in the undertaking. Such publicity is, in the most desirable manner, obtained through the authority of the Interstate Commerce Commission in its relation to the systems of accounts. In this connection the Interstate Commerce Commission represents the public, the investor and the telephone company. Consequently, the systems of accounts prescribed and embodied for the benefit of the public and the investor should show a thorough insight and lucid display of all business performed, together with the actual status of condition.

On behalf of the company the accounts should embody working details. This should be done not only as a record of historical happenings, but to provide data usable and available for the guidance of administrative officials, thus promoting efficiency.

That there are many vitally important matters in the present systems of accounts subject to criticism, is indubitably true. But we must remember that the evolution of proper accounting with respect to telephone operations is, even at the present time, in an embryotic condition. The rigidity of the prescribed systems must, we think, be made more flexible. Although some view the controlling subdivisions of accounts as adaptations of railroad accounts (which, in themselves, are not appropriate to telephone accounts) yet with all of the objections, the fact that the systems are uniform enables practical telephone accountants to pursue a careful study by comparisons. These will result in the presentation to the Interstate Commerce Commission of such modifications and changes as may be deemed necessary, by those who should be in position to know. There is little doubt but that such research will be given due consideration.

Having in mind this very idea, the National Independent Telephone Association has appointed a committee composed of three accountants. The Independent Telephone Association of America has also appointed a similar committee. It is proposed to organize a joint committee to suggest and present to the Interstate Commerce Commission such alterations and amendments in the present systems of accounts as may result from their deliberations. A joint meeting of this committee will be held in St. Louis, on June 4, and I believe that the results of this co-operative labor will be beneficial to all concerned. In order that the joint committee may receive the benefit of advice from all of the Independent telephone companies, the secretaries of the several state associations have been asked to circularize their respective members with a view to collating all data possible with reference to any changes that may be suggested. The members of this association are urgently requested to give this matter serious consideration and thus help in the imposed task; and I would impress upon you the importance of such co-operation, for these are matters which vitally affect all telephone companies regardless of their size.

It is also to be observed that the scope of the authority of the Interstate Commerce Commission extends, in addition to accounting matters and operations of minor importance, to the question of physical appraisal, although to what extent such authority will be exercised is yet to be demonstrated. This is certainly a question of the greatest importance.

When we consider the intimate relation between the Interstate Commerce Commission and the telephone companies, we are impressed with the fact that the personnel of this commission is a matter of grave concern to those interested. The vast magnitude of the telephone industry with its continuous and tremendous expansion, convinces us that it is vitally essential that members of the commission should be familiar with telephone affairs. Personally, I would be in favor of a separate commission—having defined regulatory powers over telephone companies—to be devoted solely to telephone affairs. This would be ideal, but its creation would doubtless be difficult of accomplishment.

While men thoroughly versed and experienced in railroad matters, both as to the operating and conduct of the business together with the legal technical points involved, constitute the commission, there is yet no such indirect as we might term it, representation for telephone companies. That one member, at least, of the Interstate Commerce Commission should be an experienced telephone man

is a matter which I believe merits the united efforts of the telephone industry.

While no one can gainsay the integrity of the present commission, either individually or collectively, and while to any one who has investigated the matter it is apparent that the members are zealously performing the duties of office, yet we are today in an era of personal specialization and it seems self-evident that for all concerned—the public, the investor, and the companies themselves—that there is need for one especially trained and informed in matters pertaining to telephone operations, so that decisions which are important in their effect may be rendered, not only from a judicial standpoint, but with a full comprehensive knowledge and understanding of telephone conditions. Details and essential factors which enter into the operation of telephone matters cannot be obtained except through years of practical experience, and then only through close observance and study. Such a member of the commission should have all of these qualifications. In addition thereto, he should have broad, liberal-minded views with respect to the future growth and expansion of the industry.

From among the many and efficient telephone men, some one can easily be selected who will be unbiased with respect to the telephone interests and who can also represent impartially the public and the investor. I am firmly convinced that such an appointment can be obtained by united effort and proper representation through the support of the patrons, the assistance of the investors and through the influence of telephone associations, companies and employes.

This, therefore, is the thought which I wish to remain with you: That in the appointment of a member of the Interstate Commerce Commission, the administration at Washington be impressed with the importance of the telephone industry and be imbued with the idea that every effort should be made towards having matters of such public importance placed in charge of men especially equipped to perform such duties. That such a selection should be made with this fact primarily in view is not only within the power of the chief executive, but what is more to the point, it is unquestionably his duty.

Use of the Telephone in Defense from Aerial Raiders.

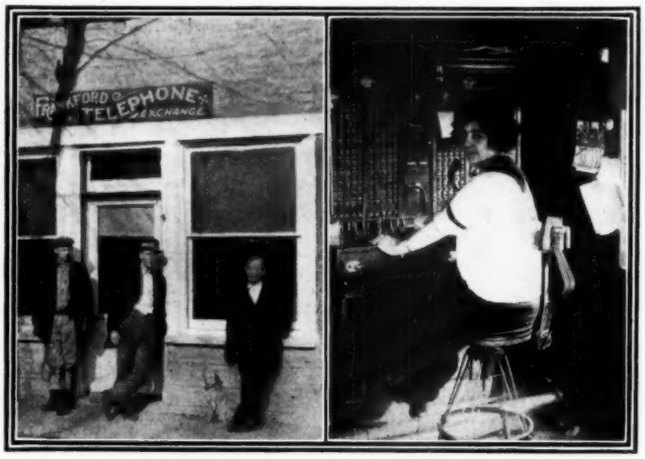
It seems that the telephones are expected to play an important part in the defense of Paris from aerial raiders, says TELEPHONY'S London correspondent. Recently when Zeppelins bombarded the French capital the bomb throwers were enabled to get over the city owing to the clever work of the German spies, who cut all telephone wires. When General Joffre heard that Count Zeppelin's aircraft had visited Paris it is said he was "very angry." He had made all arrangements for the Paris Air Patrol to successfully cope with any Zeppelins that might show up, with the aid of an elaborate system of telephoning. The night the Zeppelins arrived the members of the Paris Air Patrol were giving a farewell dinner to comrades who were off for aerial duty in Turkey the next day. The Paris watchers strove desperately to get word to the banqueters by telephone but the German wire cutters had done their work well.

New Home of the Franklin (Mo.) Telephone Exchange.

The Franklin Telephone Exchange, of Franklin, Mo., has been in operation for 13 years, starting in a dwelling house with one country line and six private city lines and increasing in size to 106 private city lines, 32 country lines and two toll lines at the present time.

Having outgrown its facilities in a residence, A. C. Miller, owner and manager of the exchange, and his son, E. C. Miller, built the quarters shown in the accompanying illustration of concrete blocks, in their spare time. The room measures 12 by 9 feet, and has a booth built in the wall. For the walls wall board stripped into panels was used, while the ceiling is of metal. The Franklin exchange now has one of the nicest little offices in the state at a very low cost.

In the accompanying illustration reading from left to right,



Exterior and Interior Views of the Franklin Exchange.

are Brooks Daily, helper; E. R. Miller, lineman; A. C. Miller, owner and manager, and the operator, Miss Genevieve Ewer, at the switchboard.

A WONDERLAND OF SCIENCE.

(*Concluded from Page 22*)

The Bureau is endeavoring to secure throughout the states uniform legislation on the subject of its standards, and also the establishment of a nation-wide system of inspection. Such a system would be able to enforce the use of honest weights and measures in daily trade, the need for which is immediately apparent when it is realized that considerably more than $100,000,000 are taken each year from the pocket of the ultimate consumer by the retailer, who often quite innocently uses dishonest weights and measures.

During the period from 1909 to 1913, the Bureau undertook to test some of the commercial weights and measures of the country, and the revelations made were startling. It was found that 44 out of every 100 scales tested were incorrect—nearly one-half of the dry measures, and more than one-fourth of the liquid measures. Someone has estimated that the total loss to the people, as a result of this inaccuracy of weights and measures, would be enough to build ten of the biggest battleships afloat every year.

When the investigation started there were only four states in the Union which had efficient systems of inspecting weights and measures. Such were the revelations that today 24 states and most of the important cities of the country have efficient inspection systems.

The Bureau of Standards is striving to have uniform state laws for weights and measures enacted in all of the 48 states. It wants a pound to be a pound everywhere and a bushel a bushel. At present it is not always so. A bushel of potatoes may be more than a bushel in one state and less than a bushel in another, depending upon the number of pounds each state says shall constitute a bushel.

False measures have a habit of running away from progressive laws. Not long ago 100,000 milk jars were condemned for short measure by the sealers of a certain state. These jars were hastily collected and sent to another state, where the laws were more lax. Here they were soon overtaken by a similar fate, and were hurried off to a new locality and are probably still on the move.

Practical Subjects—Letters and Discussions

The Art of Soldering*

By Frank Chapman.

Soldering is an art, but the art of soldering is a very simple one.

There are but four essential principles, and when these are followed, anyone can, after a little practice, do as good work as the most experienced workman.

The four principles of soldering are as follows:

1. The soldering iron must be kept clean and well tinned.
2. A good soldering flux must be used.
3. The metals to be soldered must be thoroughly cleaned, before the joint is made.
4. The joint must be heated above the melting point of the solder.

Soldering requires heat. Either a gas stove, coal stove, or a gasoline torch will work satisfactorily.

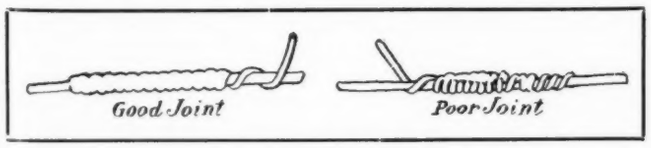
Soldering irons cannot be heated properly in the yellow or illuminating flame of the gas because it smokes the soldering iron, and also because it is not hot enough. It needs a blue flame, the same as is given off by a gas stove, but a good clean coal fire will do.

To heat the soldering iron, slip the pointed end down through the hole in the center of the burner of an ordinary gas stove so that the blue flame comes in contact with the large end of the iron. This method of heating does not burn the solder from the iron so quickly and the iron keeps hot longer.

To heat the iron in the ordinary cook stove, be sure to have a clean coal fire. Put the iron through the broiling door in such a way that the tin on the iron is protected from the flame by the lining of the stove. This leaves only the large end of the iron exposed to the fire. This method will save burning off the tinning. If gas stove or some other convenient method of heating an iron, is not available a gasoline torch may be used.

To tell when the soldering iron is hot enough, try it by putting solder to the point. If the solder melts as soon as it touches the iron it is hot enough and ready to use. If the iron is overheated the tinning will be burned off and it must be re-tinned, or if the end of the iron becomes black and the black will not wipe off, the iron needs re-tinning.

To re-tin a soldering iron if the tinning gets burned off, rub it on a clean brick, sand paper, emery cloth, or file to brighten the surfaces, and if it is badly pitted, file it smooth. Then heat it under any of the methods suggested and put on a suitable soldering flux, rubbing on the solder, at the same time going over all four sides of the iron while it is still hot,



wiping them on an old cloth. This makes the soldering point of the iron look bright and shiny, the color of new tin.

A soldering iron must be kept in this condition if it is expected to do good work. The cleaner and better the iron is kept, the better the class of work one will be able to do.

The metals to be soldered together must be thoroughly cleaned by scraping with a piece of emery cloth or a file.

With the iron properly heated and the metals ready to be joined, the next step and the most essential one in the entire operation is the use of the right kind of a soldering flux.

For ordinary work this flux should be in the form of a paste, which can be applied with a stick or a brush, or the end of the solder, to the parts to be soldered.

In selecting your paste be sure you get a non-corrosive one that is thoroughly made, and will solder all metals so that each particle that you pick up on the head of a pin has all the elements of the flux.

There are fluxes on the market that are made so carelessly that they are one preparation one day and something different the next.

Be sure to buy a flux that you can rely upon.

The best results will be obtained by holding the hot soldering iron underneath the parts to be soldered, and remember both sides of the joint to be soldered must be heated alike to make a good joint.

The solder is then held on the top, and as the heat rises it melts the flux, which should flow to every part of the joint, and later the solder melts and flows as far as the flux, making a perfect joint.

For this reason a flux that will flow a longer distance is the best to use on most classes of work.

Where it is impossible to apply the heat from below, good work can be obtained by keeping the iron on top provided one is careful to get the parts to be soldered hotter than the melting point of the solder.

When the solder has run freely take the soldering iron away and let the parts soldered get cold.

If the joint is given a slight tap while the solder is still hot the surplus will be shaken off and a clean-looking joint will be the result, but in doing this be careful not to separate the joint.

If the solder looks bunchy, while it is still warm take a cloth with a little of the flux on it and rub it over quickly. This will make a clean, smooth joint.

Practice makes perfect.

Anyone can learn to solder.

If the first job is not perfect, do not get discouraged. One is certain to get good results eventually.

There are three troubles with the poor joint shown in the accompanying illustration:

1. The wires should have been cleaned by scraping before the joint was made.
2. A good soldering flux should have been put on to the top of the joint before the heat was applied.
3. The joint was not hot enough; the soldering iron should have been held underneath to let the heat rise.

*Copyrighted, 1915.

Importance of Legibility in Operating Records and Reports.

The necessity for co-operation between departments and employes within the same department is a recognized first principle of any business enterprise. Much has been said and written about co-operation in telephone work, says a writer in the Pacific Telephone Magazine. To know what relation our work has to the work of other departments is the first requisite for successful co-operation. It is essential to know how the quality of each individual's work directly affects the employe who next handles our finished product. The value of legibility, both in handwriting and figures on the various traffic reports and on toll and measured service tickets, has frequently been emphasized within the traffic department, and campaigns have occasionally been waged to improve this particular phase of our work.

How many of our clerks or operators consider the number of employes in the accounting department who are making out subscribers' toll bills directly from the operators' tickets, or the immense force which is employed throughout the company in the summarization of various report data, originating in the central offices? How much

guessing are they doing at hurriedly or carelessly made figures, entirely changing their complexion? Could not their energy and time be more effectively used in the interests of the company rather than entailing an expense for unnecessary labor? The company's loss in such work is undeniably due to inaccuracy and carelessness on the part of some clerk or operator.

Again, the company is maintaining an adjustment department, at a considerable expense, for the sole purpose of mutually settling with subscribers the accounts which they have been unable to recognize, or which they claim do not belong to them. A certain amount of the expense of maintaining this department is due directly to operators' illegible ticket work, which can be reduced by concerted effort on the part of operators and clerks. Here is an opportunity for co-operation by our exchange forces, through which a real saving to the company may be made.

In addition to the increased expense, a direct loss in revenue results from carelessness or inaccuracy in handwriting or in making figures. Frequently causes of error in charging our subscribers are traceable to large or hurriedly made figures, the result being that a given telephone number is taken for some other, and the wrong subscriber billed. The same condition results from poor and illegible handwriting and spelling of names of calling patrons. Such bills are invariably disputed by subscribers because they do not recognize the calls. This means expense and loss of revenue to the company. In addition, explanations which are made the subscriber rarely satisfy him and he doubts our records for some time to come. We, therefore, not only lose the revenue which should result from the call, but frequently lose the subscriber's good will, which is even more important than the revenue.

The same general criticisms apply to the work of preparing routine records and reports, in order that other employes who later handle such reports may not be burdened with unnecessary work in interpreting results or in the chance of incorrect summarization of the results shown.

The question naturally arises as to the remedy to be applied in dealing with inefficient ticket or clerical work. It is, of course, necessary to start at the beginning, or with the operator. First, the student force should be taught the value of accuracy and legibility in ticket work. Then only those operators who write legibly should be placed upon positions requiring ticket work. They should be carefully instructed in regard to the necessity for accurate and careful work. Supervisors should understand that it is a part of their duties to see that operators make clear, legible, small-sized figures, and they should instruct all operators to observe the following fundamental rules:

1. Make figures small and in the center of the space provided.

2. Avoid angularity and flourishes. Do not extend loop letters until they interfere with the line above or the line below.

3. Do not leave a space between letters of the same word. This is done most frequently after a capital.

4. Dot "i's" and cross "t's." Do not place dots and crosses carelessly.

5. Write all proper names with especial care.

Lost Business Greatly Reduced by Efficiency Campaign.

The Central Home Telephone & Telegraph Co., of Louisville, Ky., has reduced its "lost business" by more than 50 per cent., according to a statement made by officials of the company. In past years the ratio of lost business was 15 out of every 100 calls. Now it varies between three and seven out of 100 calls, and the 7 per cent. loss was only for one month, so that it will be seen that the loss has been reduced considerably below 50 per cent. This includes every call on record which is not completed.

Entire credit for the gain is given by the officers of the company to the plan of organizing all the operating forces of the system. It is one of the good results that has followed the method of holding operators' meetings at the individual exchanges and every once in a while bringing them all together in district meetings. Undertaken with the idea of increasing the efficiency of the service in all its branches, the effect has been most marked in the toll department, but only for the reason that here a closer record is kept of the calls which are made.

The Cynthiana, Ky., operators' club held a meeting recently at which most of the members presented papers giving their own ideas of plans by which the service could be improved. The method has proved to be exceedingly successful in getting each girl to think of her duties, to get an idea of her right place in the telephone system and to realize that unless she is always ready to do her part the service will be affected. It is especially interesting to note the development indicated in the successive papers prepared by an operator. The first paper of almost any girl will be more or less halting, statements will be qualified and expressions of opinion will be few. After a girl has prepared and read several papers, she becomes confident that her idea. of what she is writing, is a good one and she goes right ahead and has her say, giving many original and practical suggestions.

In every one of the exchanges the subscribers are quick to say that the local service has been improved and the exchange managers report that the complaints received by them have been reduced very noticeably. The explanation for the general speeding up in the toll line service is that the district meetings have given the operators an opportunity to get around at the expense of the company and to meet the girls with whom they have been holding long distance conversations for months. Numerous friendships have sprung up in this way and many of the girls have begun to supplement their talks over the telephone by letters. Now all the toll line operators show the same industry in getting an in-call handled promptly that they show in getting service on the calls they put on the wires.

The company's investment in this direction is felt to have been money well spent. The reduction of the "lost business" alone should be more than sufficient to meet the cost of this work which includes rest rooms nicely fitted up at all of the exchanges where there are more than three or four operators employed. Besides TELEPHONY, which the company puts in every one of these reading rooms, there are two other telephone publications and the girls in the exchange determine by vote what three other magazines or periodicals of general circulation they want supplied them by the company.

for the reason that there a closer record is kept of the calls.

Telephone Service in Persia.

In Ghilan and Mazanderan, Persia, the telephone lines belong to the Hadji Mehdi Agha Co., whereas in the remaining provinces they are the property of the Société Anonyme des Telephones Persans. There is telephone service in the towns of Teheran, Tabriz, Meshed, Urumia, Maragha, Hamadan, Kermanshah, Kasvin, Ispahan, Shiraz, Resht, and Bushire.

The company holding the road concessions from Julfa to Tabriz and from Enzeli to Teheran has built a telephone line along these roads for its exlusive use. The Société des Pêcheries Lyanazoff has installed a telephone line along the shore between Bender-Gez and Gomouch-Têpé on the Caspian Sea. The Anglo-Persian Oil Co. has built a private line from the oil wells at Madji Soleiman, Abaden, to the company's refineries on the banks of the Chat-el-Arab. A private line, joining Urumia with the lake of that name, has been recently built, and has been placed at the disposition of the public on the payment of 16 cents per message.

From Factory and Salesroom

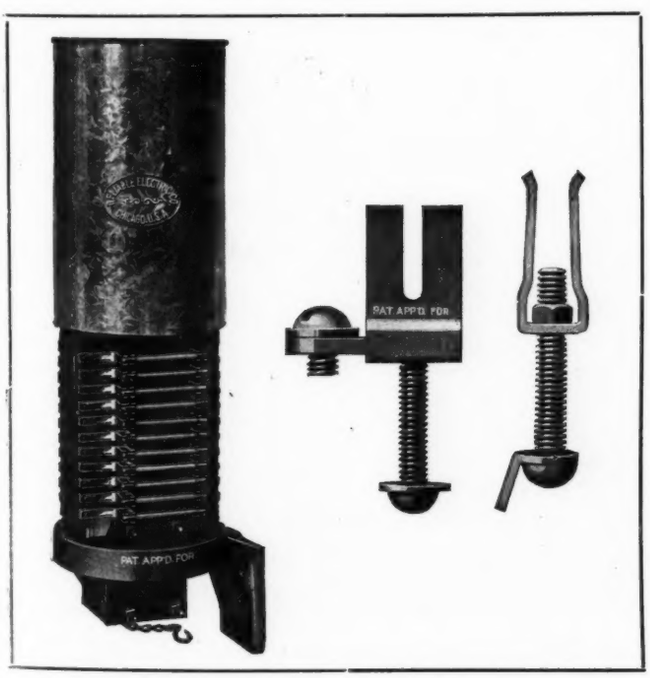
New Telephone Fuse Developed by Reliable Electric Co.

The problem of protecting telephone instruments and cables, which are connected to open wire telephone circuits, is becoming more burdensome by reason of the great number of electric and power distributing wires which are being strung every year. The fuse is the essential feature of any scheme of protection from the omnipresent distributing wire. A new fuse recently developed by the Reliable Electric Co., of Chicago, is designed to lighten the burden of the operating man in his effort to protect his property from the steadily advancing fee.

A fuse to give protection must open the circuit quickly upon the passage of an abnormal electric current. The Reliable company in developing an accurately blowing fuse found that the ordinary lead composition fuse wire so generally used would not do. It is not uniform as to melting point and cannot be soldered with any degree of accuracy, because it melts at about the same temperature as solder. The use of this wire, which is extremely soft and delicate, resulted in many fuses coming open in shipment and in service, and in the so-called good fuses blowing inaccurately when called upon to perform their function.

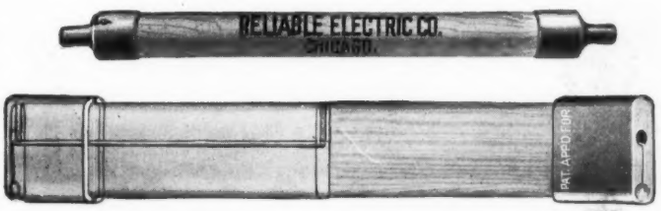
After an exhaustive test of the various combinations of metals which seemed likely to give the desired results, a fuse wire was developed which has great tensile strength and heat resisting qualities and which blows with uniform accuracy upon the passage of a predetermined electric current. The new fuse wire which was named "blow-rite" from its accurate blowing characteristics, was used in tubular fuses of the No. 27 type shown in one of the accompanying illustrations. New fuses of this type lined with the blow-rite wire were found to blow with extreme accuracy.

On account of the expense of replacing blown fuses with new ones, the majority of telephone companies make a prac-



Type A. G. Pole Cable Terminal—Fuse Clips.

tice of saving the blown fuses and rewiring them so that they may be used over and over again. In performing this service for some of its patrons, the Reliable company found that many of the refilled fuses did not blow accurately. Upon investigation it developed that the old fuse wire could not be removed from the tubular fuse, but remained inside the tube in contact with the new wire and raised the blowing point to an uncertain quantity. To overcome this difficulty a new type of fuse, known as No. 44, was developed. The fuse wire lies protected in a deep slot, open for inspection and when blown,



The No. 27 Tubular Fuse and the No. 44 Flat Fuse.

the old wire is quickly removed and new wire inserted, making the fuse as good as new.

The method used to hold the fuse in the telephone circuit is a matter of vital importance to the operating man. He needs a fuse which is readily removable for replacement or test without the use of tools and one which will make a sure contact in the telephone circuit to eliminate the possibility of open lines or noisy telephones, due to poor fuse contact. In developing the new fuse to fulfill the most important requirement, that of blowing accurately when the fuse wire is renewed, the Reliable company has gone a step farther and found a way to hold the new fuse securely in circuit.

The fuse is made with flat sides and when it is forced into the fuse mountings a large area of the fuse ferrule is in contact with the fuse clip and the act of forcing the fuse into the clips, cleans and brightens the contact surfaces. The clips are made of unusually heavy spring phosphor bronze (No. 18 B. & S. gage) formed to bring the entire inner surfaces of the four prongs in contact with the fuse ferrules. The prongs are adjusted so that a very slight movement of the spring metal takes place when the fuse is inserted and the strong grip of the clips on the fuse is not diminished by frequent removal and replacement of the fuse.

The Reliable company has placed the new fuse on the market in its type AG pole cable terminal. The terminal, the company maintains, is simple, compact and inexpensive, and is built on a well known principle which has been used successfully for many years. Installation is quickly made without a pothead.

New Monarch Board for Remsen, Iowa.

The Monarch Telephone Mfg. Co., of Fort Dodge, Iowa, has just installed a 400-line switchboard for the Remsen Telephone Co., of Remsen, Iowa, on a rush fire order. Last Saturday lightning got into the old board and started a fire which destroyed all of the working parts and almost burned up the cabinet. As the toll lines were burned out as well as the local lines, it was not until Sunday noon that communication was established with neighboring towns.

Manager Johnson, of the company, then called up the Monarch company, at Fort Dodge, and secured information and prices. Monday afternoon the order was placed and Wednesday the board was finished and shipped by express. An installer from the Monarch factory went to Remsen on the same train as the switchboard and service was restored Thursday morning. The switchboard while put through the Monarch factory in rush time was made up exactly to meet the requirements of the Remsen exchange as worked out by Mr. Johnson.

The Coghlin Ground Anchor.

A ground anchor, of the driven type, said to be most economical both in first cost and in time and labor saved in installing, is manufactured by the Track Specialties Co., of New York City. This anchor, which is known as the Coghlin ground anchor, is easily and quickly installed, requiring only the use of a hammer. It locks automatically for driving and opens automatically for anchoring. No twisting or boring is required to set it in place. Once driven, it is contended, the

The Coghlin Anchor in Driving Position and Locked in Service.

anchor is set and the earth is not disturbed. The expense of installation, the company states, is practically negligible.

The special malleable iron end for connecting the guy wire, as shown in the accompanying illustrations, obviates the expense of an eyelet. This piece also protects the hand while the anchor is being driven, and acts as a swivel to take any twist from the guy. A three-quarter inch high carbon steel rod that will not bend, is used in the manufacture of the Coghlin anchor. The anchor is furnished painted black or galvanized, as desired.

Improvement of Alliance Plant of Ohio State.

The complete rebuilding and substantial extension of its telephone system at Alliance, Ohio, is included in the program announced by the Ohio State Telephone Co., work upon which is now in active progress. The general reconstruction of the plant, both inside and outside, new conduits, new overhead and underground cable, and, where necessary, new pole lines are called for in the plans.

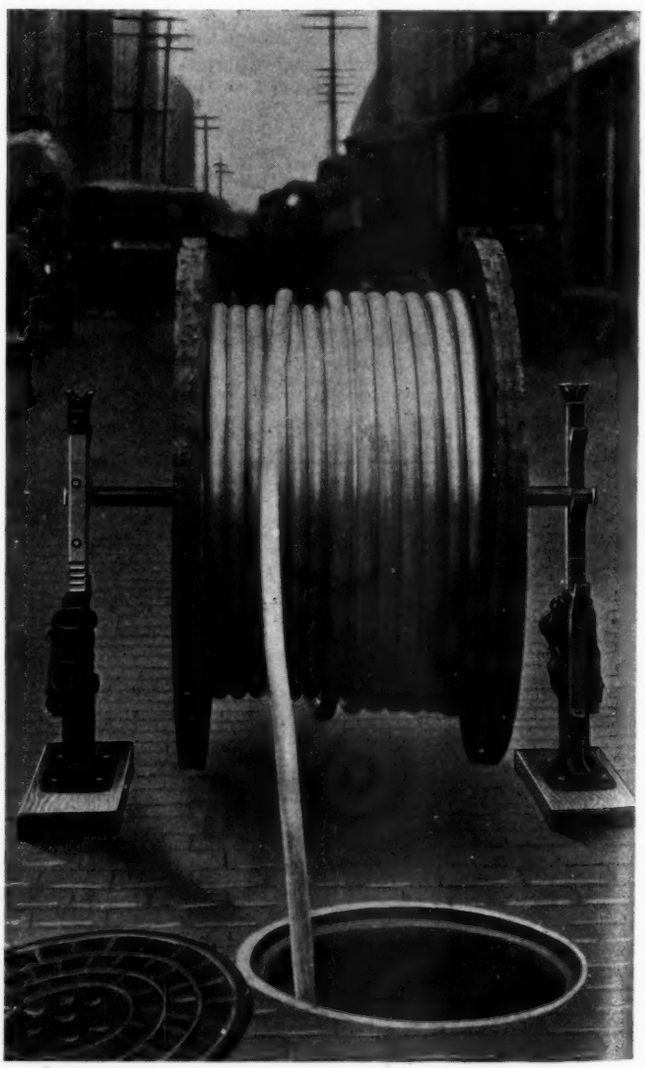
A new fireproof building will house the automatic central office equipment of 600 individual and 600 party lines which has been ordered from Automatic Electric Co. of Chicago. The same manufacturer will furnish new wire chief's, information, toll and rural apparatus.

The Ohio State Telephone Co. has the popular telephone service in Stark county, in which Alliance is located, having nearly 12,000 telephones in the three cities of Canton, Massillon and Alliance. This is a rapidly growing city of some 18,000 people, and is a manufacturing center of great activity, being the home of the Morgan Engineering Co., large makers of mining and other heavy machinery.

The Barrett Cable Reel Jack.

In installing cable provision must be made for unreeling the cable from the reel. The simpler the equipment used for this purpose, the more satisfactory results are obtained, both in labor and time saved. In the last few years various types of jacks have come into use.

The Barrett cable reel jacks are especially designed for use in elevating cable reels off the ground so that the reel may be turned easily as the cable is installed. The jack shown in the accompanying illustrations is designed to handle cable reels of various sizes. It is provided with three forged hooks, as well as a swivel top, so that a reel can be picked up on the hook nearest its center and suspended with a very small amount of ratcheting, at



Large Cable Reel Carried on Second Hook of Two Barrett Jacks.

the same time being hung just low enough to clear the ground. A pair of these reels, it is contended, will safely support cable reels of any ordinary size, the combined safe carrying capacity of a pair being over six tons on the top hook. Reels weighing from six to ten tons may be raised on the swivel top, or if the diameter of the reel permits, on either of the two lower hooks.

It is claimed that the Barrett jack raises or lowers the load five times faster than the screw type of cable reel jack, and with less than half the power required for operation. By the hook arrangement one pair of Barrett jacks can handle almost any size reel. Another important feature of the jack is that it is easy to carry around and place in position.

The strongest ribbed base and socket lever are made of a very fine grade of malleable iron. The steel rack has machine cut teeth and is heat treated. All working parts are similarly made of steel, heat treated and machined to make operation smooth, positive and easy. By half a turn of the small eccentric at the side of the frame, the load is raised or lowered, as desired. A turned

The Barrett Cable Reel Jack.

ash operating handle is furnished with each jack. The Barrett operating mechanism, it is maintained, is very simple and affords a most powerful leverage. This jack, it is said, has been used by American railroads for over 30 years.

The Duff Mfg. Co., of Pittsburgh, Pa., manufacturer of the Barrett cable reel jack, is prepared to built to order for special purposes not covered by the design just described, jacks to suit individual requirements. Although the company's headquarters are in Pittsburgh, it also maintains offices in Chicago, New York, Atlanta, Ga., and San Francisco.

Directions for Using Matthews Woodpecker Telefault.

W. N. Matthews & Brother, of St. Louis, Mo., have issued a 16-page booklet giving complete directions for using the

The Matthews Woodpecker Telefault.

Woodpecker telefault in locating different kinds of faults. These instructions were compiled by O. F. Tallman, who for over ten years has been engaged in locating trouble for both Bell and Independent telephone companies and not only understands cable trouble, but also the troubles of the troubleman.

It is claimed that the Matthews Woodpecker telefault will locate all cable troubles, except "opens." The methods for locating these faults are substantially the same as those used in connection with the Matthews type A and B telefaults, but in addition the Woodpecker telefault has a number of new and improved features. In this instrument, it is claimed, will be found a combination that permits the tester to make a quicker location and also to find troubles that cannot be found by the use of other instruments.

In this booklet is described, in a clear and understandable way, the method of locating wet trouble, shorts, crosses, grounds and split pairs. Diagrams are used to illustrate the various points brought out. The use of the telefault as a tone

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NATIONAL INDEPENDENT TELEPHONE ASSOCIATION

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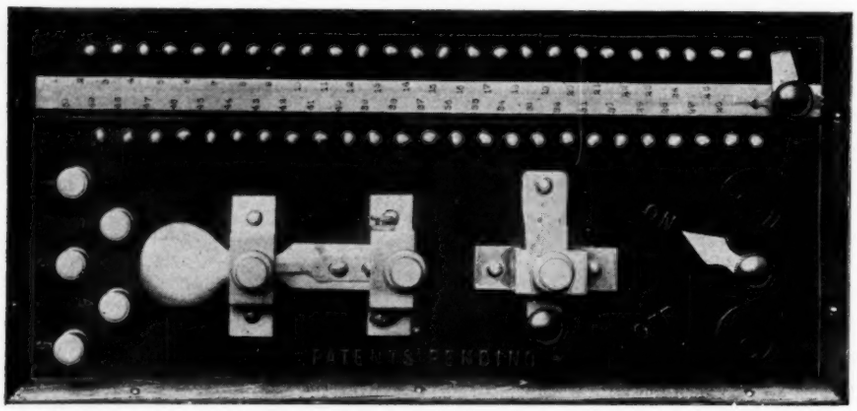
test set is clearly described, as is also its use in locating power cable troubles. Another use for the instrument which is described is that of locating concealed wires or pipes in buildings.

The Matthews Woodpecker telefault has a set of known resistances, which range from 10 to 500 ohms, by the aid of which an approximate location can be made before leaving the office. The time and work of making a location is greatly reduced when the tester once becomes familiar with the method of using the known resistances. This only applies to faults where the resistance can be figured in linear measurement or where ohms can be reduced to feet. It applies only to solid crosses and shorts with any degree of accuracy. In making the test for locating by means of these resistances, practice is a very important factor. At first it may appear that there is scarcely any change in the quality of tone, but after several tests the change in the quality of tone, which is governed by the various resistances of the fault, will be readily detected. Complete instructions for using the known resistances in making an approximate location are given in the booklet.



Top View of Telefault, Showing Resistance Scale for Approximate Locations.

W. N. Matthews & Brother will be pleased to send a copy of this book of instructions on the Woodpecker telefault to any company desirous of obtaining one, upon request.

Paragraphs.

WILLIAM DUBILIER, of the engineering staff of Foote, Pierson & Co., of New York, has gone abroad on business in connection with several wireless specialties and other electrical apparatus. Mr. Dubilier sailed on the "St. Louis" last Saturday.

THE YAWMAN & ERBE MFG. CO., of Rochester, N. Y., manufacturer of filing devices and office systems recently mailed the April-May issue of the "Y and E" Idea. This is called the "Pacific Coast Number" and contains an account of the company's exhibit at the Panama-Pacific International Exposition in San Francisco. In this issue are also related experiences of "Y and E" salesmen in various parts of the country, which will aid their fellow salesmen in becoming more efficient. The company has also just issued its general supply catalog No. 1152 E, listing, describing, and illustrating its various filing system supplies.

THE AMERICAN CONDUIT CO., of East Chicago, Ind., has issued a 20-page booklet describing the "Methods of Manufacturing Fiber Conduit." Some interesting and valuable data is also given on the cost of underground construction, including the cost of excavating, mixing and placing concrete, backfilling, etc. Any company desiring a copy of this folder may obtain one by dropping a line to the company to that effect.

Cook Protective Equipment for New St. Paul Exchange.

The Frank B. Cook Co., of Chicago, has just received the order for a 6,000-line main distributing frame equipped with No. 10 protectors for the new Park exchange of the Tri-State Telephone & Telegraph Co., in St. Paul, Minn.

The Cook company is highly gratified over this order as it not only adds one more to a considerable list of exchanges of the Tri-State company equipped with its main frames and protectors, but incidentally demonstrates that when the No. 10 protectors are once used, they continue in favor.

Condensed News Reports

Officers of Companies Are Urgently Requested to Forward to Us Promptly All Financial and Other Statements as Soon as Issued and Any Items of Interest as to Their Plants and Systems

Personal.

E. M. SQUIRES, of Afton, Iowa, has been placed in charge of the Mutual Telephone Co., of Keokuk, Iowa, succeeding Glen Fisher, who resigned his position to engage in the electrical wiring business.

D. W. HARLAN has resigned his position as manager of the Nowata, Okla., exchange of the Pioneer Telephone & Telegraph Co., to accept a position in Chicago. He will be succeeded by Paul P. Sewell, of Tulsa.

W. M. GARRISON, for the past year manager of the Lamar, Mo., exchange of the Missouri & Kansas Telephone Co., has been promoted to the management of the Springfield, Mo., exchange. H. S. Daniels, of Carthage, will succeed Mr. Garrison at Lamar.

H. E. PREVOST, for the past three years manager of the Altoona, Pa., office of the Bell Telephone Co. of Pennsylvania, has been transferred to the Harrisburg district where he will engage in special work. R. P. Sharp will assume Mr. Prevost's duties at Altoona.

L. L. MCKIM, for the past six years manager of the Ottawa, Kans., exchange of the Missouri & Kansas Telephone Co., which is to be consolidated with the newly organized Kansas Telephone Co., has been placed in charge of the reorganization of the company's exchange at Sabetha, Kans.

JOHN H. WRIGHT, general manager and secretary of the Home Telephone Co., of Jamestown, N. Y., has been chosen vice-president of the Jamestown Chamber of Commerce. Mr. Wright has been actively interested in the formation of the chamber of commerce, which was but recently organized.

New Companies and Incorporations.

BROWNSVILLE, KY.—Articles of incorporation have been filed by the Edmonson County Home Telephone Co., with a capital stock of $2,000. The incorporators are John T. Webb, P. L. Smith and A. B. Sanders.

FONT HILL, KY.—The Goose Creek Telephone Co., Font Hill, has been incorporated with a capital of $300. The incorporators are: H. J. Thomas, Wm. Robertson, W. D. Thornton.

LOUISVILLE, KY.—The Holland Independent Telephone Co. has been incorporated with a capital stock of $500. The incorporators are: W. P. Hughes, H. T. Tracy, B. W. Bannon.

OIL VALLEY, KY.—The Elks Spring Valley Telephone Co. has been incorporated with $360 capital stock. The stockholders are O. C. Bell, T. C. Catron and J. C. Elam.

Never before has a financial plan aroused so much interest and discussion among telephone companies as has the National Telephone Securities Company

Telephone companies were quick to grasp the significance of this plan when it was first announced and outlined and their hearty response has not only been most gratifying, but it shows that they recognize the value of co-ordinated effort—of a centralized plan for raising and disposing of money issues.

Heretofore, Independent telephone companies have been compelled to submit their financial propositions to local bankers—"frequently meeting with failure"—because the general public had not been educated to appreciate the safety and value as well as guaranteed earnings of a public utility.

The NATIONAL TELEPHONE SECURITIES COMPANY will act as a financial agent and clearing house for its members; will assist them to dispose of bonds and to raise money; will make loans pending sale of bonds; will aid in financing new construction and will provide a safe and regular return to its investors.

Small as well as large Independent Telephone Companies will greatly profit by this organization. Endorsed highly by both telephone associations. We are now offering 5 per cent. guaranteed cumulative profit sharing preferred stock. Par value of stock $50.

No money payable now. Send for subscription blanks and particulars.

National Telephone Securities Company

H. H. KNIPE, President

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¶ "A. B. C. Service" means that you are able to secure better results from your advertising—because your judgment of the value of publications is based on facts.

¶ You have right at your finger-tips uniform, standardized specifications and analysis of the commodity you buy, the same as your Purchasing Department.

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15 East Washington Street, Chicago

A·B·C A·B·C

Telephony is the only telephone paper which is a member of the A. B. C.

PARSHALL, N. D.—Articles of incorporation have been filed by the Parshall Farmers Telephone Co., of Mountrail county, with a capital stock of $25,000.

TUTTLE, N. D.—The Tuttle Telephone Co. has been incorporated with a capital stock of $10,000; the directors are S. P. Boileau, P. S. Tobin, R. H. Slater, Henry W. Matz, B. A. Bold.

MARIETTA, OHIO.—The Marietta Western Telephone Co., has recently been incorporated with a capital stock of $5,000. Thomas F. Holden is one of the incorporators.

ROCKPORT, PA.—The Laurytown Telephone Co. was recently incorporated at Rockport.

Construction.

EMMETSBURG, IOWA.—The Emmetsburg Telephone is laying 12,000 feet of underground cable in this city. It is also making general improvements to its plant, which will cost approximately $5,000.

MIDDLESBORO, KY.—It is given out here that the Cumberland Telephone & Telegraph Co. will expend $15,000 in rewiring and other betterments at this point, through the main office at Louisville.

SILVER CITY, N. M.—The Mountain States Telephone & Telegraph Co. is making improvements to its exchange here to cost about $15,000. The system will be rebuilt and a larger switchboard installed. The company has also adopted plans for a new exchange building which it will erect later on.

Financial.

PHILADELPHIA, PA.—The Keystone Telephone Co. has recently declared its semi-annual dividend of 3 per cent.

RUDOLPH, WIS.—The Rudolph Telephone Co. has increased its capital stock from $2,500 to $12,500.

Elections.

KEMPTON, IND.—The Citizens Telephone Co. elected F. J. Wheatley, A. C. Miller, Peter Samuels, Delt. Johnson, Oscar Ramsayer and J. C. McMullen as directors for the coming year.

ELY, IOWA.—At a recent meeting of the Ely Telephone Co., P. F. Fuhrmeister was elected treasurer, and H. Smith, secretary. The new directors are W. Cadlec, John Lorenc and J. C. Smith.

POTTER, KANS.—The stockholders of the Mount Pleasant Telephone Co. held their annual meeting recently and elected the following officers for the coming year: Arnold Brown, president; B. Dempster, secretary; U. Boyd, treasurer.

CHINOOK, MONT.—The stockholders of the Chinook-Cleveland Telephone Co. have elected their directors and officers for the ensuing year as follows: L. V. Bogy, president; James Griffin, vice-president; Elda Sharples, secretary-treasurer; W. H. Duke, W. S. Young and Frank Browne.

SANTA FE, N. M.—At the annual meeting of the stockholders of the New Mexico Telephone Co., E. J. D'Arcy, Mrs. Irma D'Arcy and John K. Stauffer were elected directors. Electing the following officers E. J. D'Arcy president, John K. Stauffer vice president and Mrs. Irma D'Arcy secretary and treasurer.

CONNOQUENESSING, PA.—The annual meeting of the Connoquenessing Telephone Co. was held recently and R. S. Steen and Edwin Young were elected to the board of directors. The other members of the board are Dr. J. L. Christie, William Purviance, C. C. Sherman, P. P. Roe and H. K. Dyke.

CANTON, S. D.—The stockholders of the Canton Co-operative Telephone Co. held their annual meeting recently and elected directors as follows: C. B. Kennedy, M. Kennedy, Thomas Thorson and H. N. Cooter.

RICHLAND, WASH.—The Richland Telephone Co. has elected the following officers for the ensuing year: H. P. Miller, president; H. E. Compton, vice-president; F. A. Friermood, secretary-treasurer.

Miscellaneous.

EMMETSBURG, IOWA.—The Western Electric Telephone System, of Mason City, Iowa, has purchased the interests of the Palo Alto Telephone Co., which operates a rural exchange out of Emmetsburg and a rural and local exchange at Graettinger, Iowa.

WAYNESBURG, PA.—The exchanges of the Greene County Telephone & Telegraph Co. and the South Pennsylvania Telephone & Telegraph Co. were recently damaged by fire to the extent of $2,500 each.

TEXARKANA, TEXAS.—The Texarkana Telephone Co. has purchased the local exchange from the Southwestern Telegraph & Telephone Co.

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are guaranteed to be weatherproof and troubleproof.

Lightning slides through them like the water off a duck's back.

In service wherever lines are run.

Sold by the leading supply houses.

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Interchangeable Unit Office Fixtures and Partitions
Write for Catalog
C. H. BROWNELL, PERU, IND.

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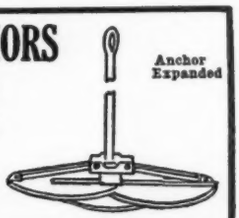
Write for Prices
NATIONAL TEL. SUPPLY CO., Cleveland, Ohio

EVERSTICK ANCHORS

Have the greatest holding power. More "Eversticks" used than all other patented anchors. *There's a reason.* Write for literature.



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(Patent Pending)

PROTECTION FROM INJURY: The point where the two leaves of the FOLDING DOOR meet is of such design as to prevent any possible chance of injuring the fingers. This feature makes the FOLDING DOOR booth a practical proposition.

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Dean Electric Co. No. 1800 Straight line common battery Steel Hotel Sets @ $3.75; Harmonic with any cycle ringer..... $4.75
Kellogg No. 631 Straight line common battery Steel Hotel sets @ $4.00; Harmonic with any cycle ringer..... 5.00
Swedish American No. 99, 5-bar 1600 ohm bridging compacts..... 7.00
Monarch 3-bar 1000 ohm bridging Hotel sets @ $3.75; with hinged transmitter 4.00
Kellogg talk and ring through type repeating coils..... 2.25
Dean Electric Co. No. 1620 Phantom coils..... 3.00
No. 1 glass knobs, size 1½x1½ inches, per 100, 60c; lots of 1000... 5.00

For complete list of standard apparatus refer to our REBUILT BARGAIN BULLETIN No. 6 (Free on request). Stock received since Bulletin was published shown in our TELEPHONY ads.

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